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oped to meet it. There are materials with extra high heat resistance, others with high moisture resistance, and others of exceptional dielectric strength. Some varieties are very tough, strong and shock resistant. When maximum plasticity is demanded there are Bakelite Materials possessing this property. Materials in a wide range of colors, standard and special, have also been developed.

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A Greeting - Hope and Pledge

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We pledge continued research for the development and betterment of the art of molding and molded parts.

MOLDED INSULATION SECTION
of the
NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

PLASTICS & MOLDED PRODUCTS

Reg. U. S. Pat. Off.

Volume 7

JANUARY 1931

Number 1

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The stove control parts at the right, molded by American Record Corporation, are representative of the many such parts turned out by hundreds of thousands annually for the country's leading stove manufacturers. These illustrations show accuracy of molding and beauty of design, and illustrate molded stove parts with and without metal inserts. Such parts may be had in black and in plain or mottled colors.



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PLASTICS & MOLDED PRODUCTS

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1930 -- The Close of a Significant Decade of Molding

By C. J. Romieux

Manager, Indur Dept., International Combustion Tar & Chemical Co.

BECAUSE of its enormous possibilities, the plastic industry is today attracting wide attention not only in technical circles but also in the industrial world. Its growth has been so great in the past ten years that it may be well to call attention to the influences that have brought it about. In 1920 molded plastics were applied to but a restricted number of uses. Celluloid, shellac, and relatively high priced phenol resin were the only materials then available. Today the molder has a much wider choice of material. Urea resins, many varieties and grades of phenolic resins, vinyl products, and cellulose acetate have all been developed during the last ten years. The principal molded products in 1920 were phonograph records, buttons, celluloid novelties, and electrical insulating parts.

The Infinite Variety

Today the variety of molded goods is well nigh infinite. Taking as an example phenol plastics, we find that in 1920 their use as restricted very largely to electrical insulation. Today this group of plastics finds extended applications, in many such unrelated products as furniture, cameras, interior decorations, novelties, chemical apparatus, bottle caps,

picture frames, soda fountain accessories, automobile parts, and phonograph records. There has also been very great expansion in the amount of phenolic plastics used in the electrical industry—for telephones, radios, switches, switch plates, electrical outlets, etc.

I believe that expansion of the phenol plastic industry is to be attributed to three basic causes. In the first place, due to intensive research, not only has the cost of these compositions decreased, but their quality has been very greatly improved. One of the greatest contributions of the research chemist has been the development of very fast curing compositions which have made it possible for the molder to speed up production, thus affording him the opportunity to further decrease his manufacturing costs. Secondly, improvements in the quality of compositions have also been reflected in the quality of the molder's product. This, in turn, has permitted him to develop moldings adapted to many new service conditions. The third important cause is to be attributed to the fact that thermo-reactive molding compositions are particularly well suited to mass production methods. Molded parts, as we all know, are most economically

produced when it is possible to attain a high rate of production over a considerable period of time on one single item. Thus, molded products find their greatest field when standardized parts are required. Improvements in the technique of molding and in the production of dyes have also been important contributing factors.

New Materials and Properties

Concurrently with these improvements in the phenol plastic group, the special qualities of other materials have permitted the use of molded plastics in many fields where phenolic materials are not particularly well suited. The light color and translucency of urea plastics, combined with their lack of odor, relatively high resistance to shock, chemical stability, and light weight, have put in the hands of the molder a material which now allows him to sell his products in many of the fields formerly restricted to glass and ceramics. A further example is to be found in the recent development of an extremely fast curing plastic which has made possible the production by hot stamping methods of a new type of inexpensive phonograph record.

The great variety of molded plastics in common everyday

use may perhaps best be illustrated by following the daily routine of a modern business man. Just as he is enjoying those last few precious moments of sleep, he is awakened by the buzz of an electrical clock mounted in an artistic molded case. At his bedside there is a small table with a glossy laminated top on which are a molded vacuum bottle and a molded ash tray—even the drawer of this table is fitted with molded pulls. His bed rests on molded casters. Many are the products of the molder in his bathroom—toilet seat, tumblers, electrical outlets and plugs, and even his razor. His tooth paste, shaving cream, facial lotions, medical and toilet preparations are tightly and conveniently sealed with attractive molded caps in a multitude of colors and effects. Even his comb and brush are of molded products. The doors of his house are fitted with molded knobs and escutcheon plates. Every one of the many electrical devices in his house contains one or more molded parts.

As he steps into his car he throws on the ignition, adjusts

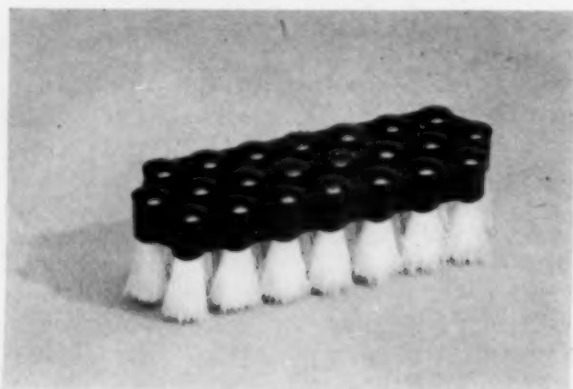
the throttle and spark by pushing little molded levers. In shifting gears he grasps a molded knob and presses a molded button to sound the horn. Were he curious, under the hood of his car he would find a molded distributor and discover that the timer is driven by silent and efficient molded gears. The railroad car in which he rides to the city is equipped with a self-contained lighting system made possible by the use of molded electrical insulation. The signal system which guides his train swiftly and safely to its destination incorporates many molded parts in its invisible mechanism. From the railroad station he steps into a crowded subway car and grasps a sanitary molded handle which has replaced the unsightly straps formerly used. In the generation, distribution, and control of the electrical energy which drives the subway train, lights the city, and runs the elevator swiftly up to his office, many molded parts are efficiently serving him. On his office desk there is a molded telephone hand set, molded

pen-holder and desk set, a molded calendar case, cigarette box, and ash tray. Many molded parts are incorporated in typewriters, dictaphones, accounting and calculating machines. At noon he goes to a restaurant where luncheon is served him on molded trays. Or perhaps he has only time to stop at a soda fountain for a sandwich. Here he finds molded cup holders, molded laminated counter and table tops, and even molded cups and dishes. Behind the counter there are ice cream cans with sanitary molded covers. As he returns to his office he lights a molded pipe with a molded pocket lighter and dwells upon the versatility of molded plastics.

Just a Beginning

Yet the future applications of molded products offer almost unlimited possibilities. During the past year the entire molding trade has been most active in developing new applications for its products. Many of these are just beginning to be exploited. An increased use of molded housings has recently

(Continued on page 46)



Ten years ago, this brush of unusual design would have been considered utterly impractical. Displacing wood and metal entirely, molded resinoid provides a brush, both handsome and sanitary.

Photos courtesy Bakelite Corp.

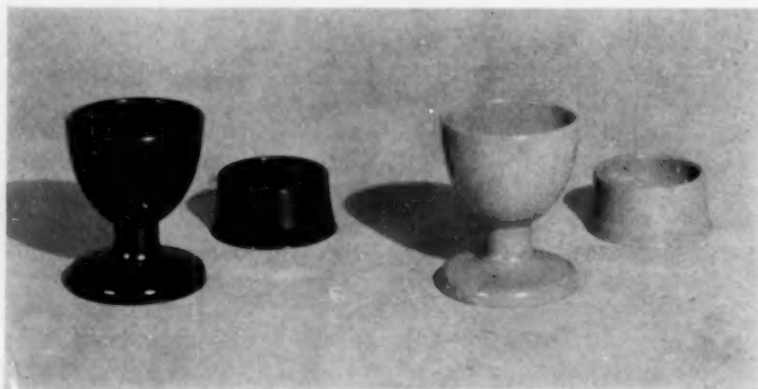


Photo courtesy General Plastics, Inc.

The electric clock is typical of the modern practise of housing precision instruments in molded cases. Rapid, uniform, quantity production and permanent, high finish are outstanding advantages.



Molded tableware in black, contrasting and pastel colors are becoming the vogue. These egg cups make apt companions to molded salt cellars, cups and saucers and compartment plates.

Artistic and Ornamental Effects With The Artificial Plastics

How the synthetic resins have aided in the reproduction of nature's products and in the decorative arts

By Charles W. Rivise

SOME of the best minds have been engaged for years in producing novel imitative effects in all kinds of artificial materials. Much of the success has been in the field of artificial plastics, as one can readily see by glancing through any issue of Plastics at random. And apparently no one type of artificial plastic seems at the present time to have the edge in the variety of pleasing effects that have thus far been placed before the purchasing public. The reason for this is that most methods of producing the imitative effect such as veining, graining, marbleization, striation, etc. depend less upon the type of material employed than upon the particular method of dispersing the color. In fact, a large number of the methods previously used to produce artistic and ornamental effects in one type of plastic can with a very small change in procedure be adapted for another type.

Pyroxylin Excluded

In the following abstracts have been included all the United States and foreign patents disclosing methods of producing imitative effects of artistic and ornamental nature in resinoid materials. There have also been included many patents mentioning other types of plastics, as some of the methods are adaptable to resinoids. However, pyroxylin and analogous types of plastics have been specifically excluded as that field has been adequately covered by Dr. Rossman in a review entitled "Pyroxylin As An Imitative Material", Plastics, February to November, 1929.

We present here a carefully prepared digest of the patents, both United States and abroad, covering what has been patented in this field.

It seems that almost every conceivable scheme has been tried, but to the versatile inventor there is plenty of room left in which to experiment and devise.

United States Patents

1. W. F. Niles. 217,705; Mar. 31, 1879. An ornamental surface for blood albumen buttons is made as follows: Horn or hoof is ground, mixed with adhesive such as gelatin or albumen and then mixed with dry colors, sheeted, dried, broken up and sprinkled into molds in which the blood albumen is to be molded.

2. M. L. Deering. 408,222; Aug. 6, 1889. Ornamental objects such as buttons are made from the following composition: Fibrous materials such as wood pulp and/or asbestos are reduced to liquid state with water mixed with equal amount of blood after which the temperature is raised to 170 to 200° F. Before or after the heating operation a waterproof gum such as rosin, gum shellac or gum copal may be added as well as creosote to impart appearance of horn.

3. A. Luft. 735,278; Aug. 4, 1903. A plastic material suitable for making imitation amber, tortoise shell, merschaum, coral, billiard balls, buttons, ro-

settes is made in the following manner: Equal parts of phenol or its homologues or derivatives and formaldehyde or its polymers, isomers or homologues are heated with a condensing agent as sulphuric, hydrochloric or oxalic acid. Mass that separates is washed with water, then with alkali, dissolved in formalin and glycerine, or alcohol may be incorporated to prevent hardening with or without dyes and fillers.

4. L. H. Baekeland & N. Thurlow. 1,019,408; Mar. 5, 1912. Filed April 30, 1909. An ornamental surface is produced upon wood in the following manner: Liquid fusible phenol condensation product or the reagents necessary to produce said product is applied to the surface of slightly heated wood which is then pressed against grained or ornamental surface and the temperature raised. Wood may be impregnated with phenol condensation product and compressed during act of finishing to increase density of surface. The coating material may be colored. Veneer may be coated by dipping in phenolic condensation product and then applied to base of wood, metal (steel or aluminum), asbestos, fabric, paper, stone or pulp board.

5. J. W. Aylsworth. 1,046,137; Dec. 3, 1912. Reissued as 13,531. Embossed articles, novelties, buttons, toys, book covers are made from a phenolic condensation product incorporated with a plasticity agent such as a higher halogen substitution derivative of a phenol, cresol or naphthol. Among the examples

are mentioned mono, di, tri and penta-chloro-phenols added to reagents before the condensation.

6. O. Eberhard. 1,083,275; Jan. 6, 1914. Method and apparatus is disclosed for making articles from plastic cords of different colors. The plastic cords are led into a mixing chamber under constant pressure where they are united into a patterned cord. In Patent 1,095,979 Eberhard discloses means for changing the patterned effect made as described above.

7. J. W. Aylsworth. 1,094,828; April 28, 1914. Filed Aug. 26, 1910. A mold is painted or dipped into solution of fusible phenolic condensation product mixed with a hardening agent such as a methylene-containing body or with the reagents necessary to form the condensation products such as phenol and formaldehyde. The condensation product may be that described in Patent 1,029,737 and 1,020,593 or various shellac substitutes of phenolic or cresolic origin or the coating material may be the lacquer or varnish described in Patent 1,098,608. The solvent may be a volatile one such as amyl alcohol or a solid solvent such as mononitro-naphthalene, oil of mirbane, camphor oil, di-nitro-benzol, acetanilide, phthalic anhydride, or anhydrous phenol. In case phenol is used an excess of hexamethylenetetramine must be supplied to interact therewith. An inert pigment may be incorporated into the coating. The coating is dried and heated to form final product, the object to be surfaced is compressed thereagainst under heat and the object removed with its coating. A great many articles such as white billiard balls, disk or cylinder records, colored veneers or embossed or plain articles of furniture, colored designs or pictures in a variety of colors, letters or figures on objects, buttons, toilet articles, ornaments, tools, instrument handles, parts of jewelry, toys, tiling, book covers,

ornamental lumber and wall covers may be formed by this method. Paper dishes may be surfaced and ornamental designs similar to those used upon China Dishes may be made thereon. Mother of pearl surfaces may be made by coating the mold with transparent lacquers and dusting powdered or granulated pearl shell on the sticky coating or by painting the mold with a mixture of powdered pearl shell and phenolic lacquer solution. White surfaces can be made from a mixture of powdered phenol resin described in Patent 1,029,737 and 1,020,593, trioxymethylene, a solid fatty acid such as stearic barium sulphate or other white pigment and a solvent such as amyl alcohol. Pictures, photographs and colored designs may be indelibly molded on the surfaces of objects by first coating the mold with a transparent film of phenolic lacquer, applying the design to the coating and protecting the same by means of a final coating of lacquer before pressing the article to be surfaced thereby. Articles may be molded of materials which themselves will not stick to hardened veneer, by applying the veneer in several coats and leaving the last coat dry but unhardened before pressing the article thereagainst.

8. J. W. Aylsworth. 1,098,608; June 2, 1914. Filed Feb. 11, 1910. A product suitable for use as an enamel for metals, wood, cardboard, fabric, paper, or leather; to form surfaces for embossing operations, and which may be incorporated with inert pulverized fillers and pigments to form veneers for wood, and with woven fabrics or paper to form binding for books may be made in the following manner: Phenolic resins such as described in Patents 1,029,737 and 1,102,630 or any of the so-called shellac substitutes of phenolic or cresolic origin are dissolved in methylated spirits, grain alcohol, wood alcohol or acetone, or mixtures thereof together

with hexamethylenetetramine or the products obtained by reacting upon aqueous ammonia with formaldehyde or polymers thereof as described in Patent 1,020,593. The phenol resin and hardening agent may be anhydrous. The ingredients may be separately dissolved in the solvents and mixed or they may be dissolved together or the solvent may be omitted and the methyleneamine and phenol resin mixed while the resin is in fused condition in which case the mixture may be rolled into thin sheets for being dissolved in the solvents or made up into rolls. When used as a varnish, the product is hardened by passing heating device over surface. When used as film to be applied to a backing to be embossed or shaped, a suitable solid solvent such as mentioned in Patent 1,102,630 should be incorporated therewith. Among such solvents are mentioned naphthalene and some of its derivatives especially the mononitro, di-nitro and mono-chloro and tetra-chloro-naphthalenes, dinitro-benzene, preferably the meta variety, acetanilide, ricinoleic acid and ricinelaidic acid and their anhydrides, benzoic acid and anhydride and diphenylamine.

9. J. W. Aylsworth. 1,098,610; June 2, 1914. Filed Oct. 28, 1913. A plate made or surfaced with a phenolic condensation product containing a plasticity agent is pressed while hot and plastic against the particular design, which may be in relief or intaglio, and cooled while in contact therewith. A coloring material may be rubbed over the surface of the plate, and the depressions filled with a contrasting pigment, after which the surface may be ground and coated with a varnish such as collodion, cellulose acetate, copal or an alcoholic solution of a phenolic resin.

10. W. A. Beatty. 1,134,436; April 6, 1915. Filed Aug. 26, 1913. Wood, paper, leather or other porous substance is subjected to heat in a vacuum to

open the pores and treated with the synthetic gum produced by the action of formaldehyde on dioxy-diphenyl-dimethylmethane in the presence of acids or alkalis as described in Patent 1,225,046. The gum may be applied in a pure and liquid state, or diluted with solvents. The impregnated material is heated with or without pressure or subjected to ordinary temperature without pressure. The gum may be suitably colored or salts may be incorporated therewith which, when liberated in the grain of the wood, will produce highly artistic effects.

11. W. A. Beatty. 1,156,969; Oct. 19, 1915. Filed Jan. 3, 1913. Product suitable as a substitute for rubber, celluloid, ivory, tortoise shell or horn in the making of combs, buttons, etc., is made from a mixture of cellulose acetate or nitrocellulose and dioxy-diphenyl-dimethylmethane made as described in Patent 1,225,748. Mixture may be dyed or colored and incorporated with fillers and camphor or camphor substitutes.

12. W. A. Beatty. 1,158,962; Nov. 2, 1915. Filed Jan. 3, 1913. Dioxy-diphenyl-dimethylmethane made as described in Patent 1,225,748 is used to make articles usually made from ivory, amber, horn, tortoise shell, or celluloid or to coat such articles. The gum may be incorporated with fillers or dyes or pigments. Wood made porous by heat treatment may be stained, coated with the gum and made into articles of furniture.

13. F. Thomas. 1,159,878; Nov. 9, 1916. Veining, graining or designs are produced by allowing separate streams of variously colored alkali caseinate solutions to fall freely in the form of drops on to a common point within a precipitation bath consisting of calcium chloride and formaldehyde.

14. F. Thomas. 1,159,879; Nov. 9, 1915. Rough blanks for buttons and beads are formed by forming separate cells open at their upper ends within a body of coagulating solution (magnesium chloride or calcium chloride) and allowing streams of alkali caseinate to flow in freely.

15. L. H. Baekeland. 1,160,363; Nov. 16, 1915. Filed Nov. 30, 1910. Signs, ornaments and fancy articles may be made in the following manner:—A base consisting of plaster of Paris, mixtures of magnesia with asbestos or other fiber, Portland or artificial cement is coated with or dipped into initial phenolic condensation product dissolved in alcohol or into reagents that will react to form such product. Heat is applied to harden. Pigments may be incorporated in the product.

16. L. H. Baekeland. 1,160,365; Nov. 16, 1915. Division of Patent 1,160,362. Fancy or ornamental articles such as buttons, knife handles, umbrella handles, billiard balls, pipe stems, trays, furniture, etc. are formed from composition made as follows:—Partial phenolic condensation products or necessary reagents to form same are mixed with wet wood pulp, soda pulp, cellulose, asbestos, rag, cotton, etc., with or without suitable condensing agents which may afterwards be neutralized with salts of aluminum, copper, iron, zinc, cobalt which will modify the color of the product. Sizing material such as starch, glue or resinous soaps may be added as well as fillers such as China clay, soap stone, mica, aluminum powder or powdered final condensation product. Different colored papers may be used and paper may be given a gloss by dusting over with partial phenol condensation product.

17. L. Lilienfeld. 1,217,027; Feb. 20, 1917. Division of Application Serial No. 754,333 a continuation of which has matured into Patent 1,217,028. Invention

is directed to use of ethers of cellulose as substitute for cellulose esters in the manufacture of films. The ethers of cellulose such as cellulose ethyl ether made as in Patent 1,188,376 is dissolved in any of the solvents mentioned in Patent 1,217,028, mixed with softening agents and colloidizing mediums among which are mentioned resins and the resinous condensation products of phenols and aldehydes or of the aromatic amines and aldehydes and made into films in the usual manner. Product may be used in photography, as substitute for glass, cellulose or nitrocellulose for gelatin in ornamentation or packing.

18. S. Satow. 1,245,981. Nov. 6, 1917. Filed Dec. 30, 1916. Refined proteid from beans, peas, wheat, corn, etc. is subjected to action of glutinizing agent such as phenol or cresol and treated with suitable condensing agent such as formaldehyde, hexamethylenetetramine or trioxymethylene. Suitable aniline dye or pigment and solvent such as benzine may be added.

Product may be used to coat wood, bamboo, stone, earthenware, glass, metal, paper board, etc. Product may be applied to stone or concrete to produce facing tile or ornamental cornices or to glass to produce stained glass effects.

19. S. Satow. 1,245,982. Nov. 6, 1917. Filed Feb. 1, 1917. Substance such as described in Patent 1,245,981 mixed with aniline dye or pigment and nitrobenzol, aniline, carbon tetrachloride, chloroform or oleic acid is applied to article such as brick cement tiles, blocks or paper board which may have been coated with starch paste and some earthy material to give smooth surface. Air may be removed from body by means of vacuum before impregnation. Ornamental effect may be produced by applying differently coated liquids to different parts of the article or by making picture, design, etc. like ornamental stained glass.

Aldehyde Resins Made from a Single Raw Material

Acetaldehyde, paraldehyde, aldol, crotonaldehyde form basis for products similar to other synthetic resins

IN contradistinction to the phenolic resins, there are those made entirely from aldehydes, ketones and similarly substances. As but little has been published on this subject a somewhat more detailed description of the process may be useful.

W. O. Herrman and H. Deutsch in their U. S. P. 1,767,759, describe the process as follows. An interesting side-light is that this application remained "only" nine years in the Patent Office, being filed in 1921.

This invention relates to a process of manufacturing resinous condensation products. It is known that in the condensation of acetaldehyde with alkaline substances viscous resin-like compounds are obtained, which are known by the name of aldehyde resins. These aldehyde resins have been looked upon as undesirable by-products of no technical possibilities and it was not until quite recently that they have been utilized for certain technical purposes, for example, as a substitute for linseed oil.

Further Condensation

Our present invention is based on the discovery that it is possible to obtain from the viscous resin-like products, which, for example, are formed by the action of an alkali upon aliphatic aldehyde with more than one carbon atom, as, for instance, acetaldehyde, solid resinous condensation products of valuable technical properties, by subjecting these viscous products of condensation to a further treatment with alkaline acting means.

When further subjecting

these viscous resin-like products to a treatment with alkaline acting means, while taking proper care that these products are brought into contact with the alkaline solution in a finely divided state, solid resinous condensation products will be obtained, which may be filtered, pulverized, and freed from the alkaline solution.

Instead of starting from the viscous resin-like products, one may start from their parent substances, i.e. the aliphatic aldehydes and their non-resinous transformation products, such as paradol, dimere of crotonaldehyde. As alkaline substances hydroxides, and carbonates and sulphides of the alkali group, the hydroxides of alkali earth group and other alkaline compounds may be used.

Both concentration and quantity of the alkaline substances may be subjected to changes within very wide limits.

Acetaldehyde Vapor

Acetaldehyde may also advantageously be used in the shape of a vapor diluted with indifferent gases, which would serve as a mixing agent for the liquid. It is of practical value to let the gas circulate, so that part of the reaction heat, which has become free, may be removed, by the condensation of the gaseous water. If desired, one may add a suitable solvent, such as paraldehyde to the solution for the solid masses, which are formed during reaction.

Solidification of the viscous products of condensation by the employment of alkaline substances in accordance with this invention may likewise be effected by rolling or kneading them with alkali lye.

Example 1

500 parts of acetaldehyde are gradually introduced into a container with 300 parts of 20% sodium solution, which container must be provided with a vigorously acting stirring device and a cooling jacket. Under dissipation of heat, which may be done by cooling, first of all some fluid products are obtained which, on the continued treatment with the sodium solution quickly become more viscous or tough and finally assume the shape of a solid red-colored compound. This may then be separated from the superfluous liquid by filtration or otherwise.

Example 2

Add 300 parts of a 20% sodium solution to 300 parts of paraldehyde into a stirring vessel provided with a cooling jacket. To this are gradually added 500 parts of acetaldehyde. After the reaction ceases, the resinous solution thus produced is separated from the mother liquor and the resinous condensation product may be obtained from the solving agent by a refining process. One may, however, also employ the solution direct, for example, for use as a varnish.

Example 3

500 parts of aldol are introduced, while stirring and cooling, into 500 parts of a 5% sodium solution. The process of the reaction corresponds to that referred to in Example No. 1. After a short time, solid resinous condensation products will be obtained.

Example 4

400 parts of crotonaldehyde are introduced, while stirring and cooling, into 200 parts of
(Continued on page 50)

Colorful Molding Materials as applied to The Automobile Industry

By **W. K. Woodruff**

Sales Engineer, Celluloid Corp.

DURING the early years of automobile manufacture all efforts, and available engineering ability, were naturally concentrated on the development and construction of the individual motors and their complementary parts. High speed tests, elaborate road tests, mountain climbing, and desert crossings have all contributed to the motor development by bringing out weak spots in design and furnishing definite data from which the engineers could calculate their safety factors and, thereby, increase the life of the motors and parts. This work has been so thoroughly done and engineering details so minutely worked out that today the individual purchaser of any priced car has very little to worry about as far as the life or working qualities of the motor is concerned, and can be pretty well assured that he is getting his money's worth. This fact is well proven if you consider how many men are actually buying cars today, mainly on appearance and design, and when it comes to a lady's choice, who after all has the final choice in most families, we know that color and style win.

Molded Colors Studied

So, during the past few years, the engineers of the various automobile manufacturers have directed more and more attention to the color and style problems of their cars. They have employed artists, color designers, stylists and varied types of specialists to work out their color problems. They have con-

ducted elaborate color educational programs to stimulate the proper interest and appreciation of color blends and richness of tones. They have worked into their body colors the color blends of rich materials, and the interior trims and upholsteries have been of complementary tones. In this search they have studied the color effects in rare old tapestries, in quartz and other natural stones, and even the plumage of birds. All details have been studied and worked out with minute detail, even as in the forerunning motor design.

But in this styling of color and design there naturally enters the element of chance, that it will or will not appeal and take with the public. Colors must be forecast for the coming year and new effects must be continually created to stimulate the public interest. This is especially true at the present time, since cars in the same price range compete more and more on style and appearance, and the engineers are always glad to obtain whatever help they can from the material manufacturers.

In appreciation of this fact, the Celluloid Corporation recently conducted a thorough investigation in the automobile industry and obtained their re-



W. K. WOODRUFF

GRADUATE, Mechanical Engineer, Drexel Institute, Philadelphia, Pa., 1920. Immediately went with the Celluloid Corporation and took the factory training course. Did considerable work in Development and Research Dept., and at one time was Development Engineer of the Manufacturing Department. Worked in capacity of Sales Service Representative for several years. Then went into direct sales work and built up a very good territory in the metropolitan area.

Since January, 1930, Mr. Woodruff has been Sales Engineer with the Lumarith Division and has been taking the story of this new and interesting material throughout the country.

action to light-colored molding materials for interior trim and hardware parts. Much time had been spent in the preparation of a complete display of molded parts, the assembly of which involved many of the trade molders in the country, as the available molds were widely scattered. The cooperation of the trade molders in quickly making up these samples, did much to speed up the investigation. This complete display of attractive, molded automobile hardware parts was then presented to the Body and Design Engineers of the leading automobile manufacturers in this country. It was taken as

well to the auto body manufacturers and the hardware manufacturers, and everywhere was very favorably and enthusiastically received. The body engineers began to visualize new color effects for their interiors and perhaps new parts to be molded. The hardware engineers at once took to the colorful molding material in conjunction with their hardware parts. They could see where it would set off, to best advantage, their very attractive metal designs and finishes. Some of them even expressed the thought that they would make new designs in metal to go with the molded parts. The display, which was exhibited, included steering wheels, gear shift balls, control parts, choke buttons, panel pulls, vanity cases, smoking sets, door knobs, escutheons, door handles and dome

lights. The parts were all molded in the same color, which was a neutral mottle, capable of harmonizing with various upholstery tones, and really made a very impressive exhibit. The engineers reacted at once and felt that here was something that would solve one of their immediate problems of new effects. They all expressed the opinion that the right amount of molded parts, in the proper colors, and in conjunction with their present or redesigned hardware, would undoubtedly increase the attractiveness of the sedan interiors.

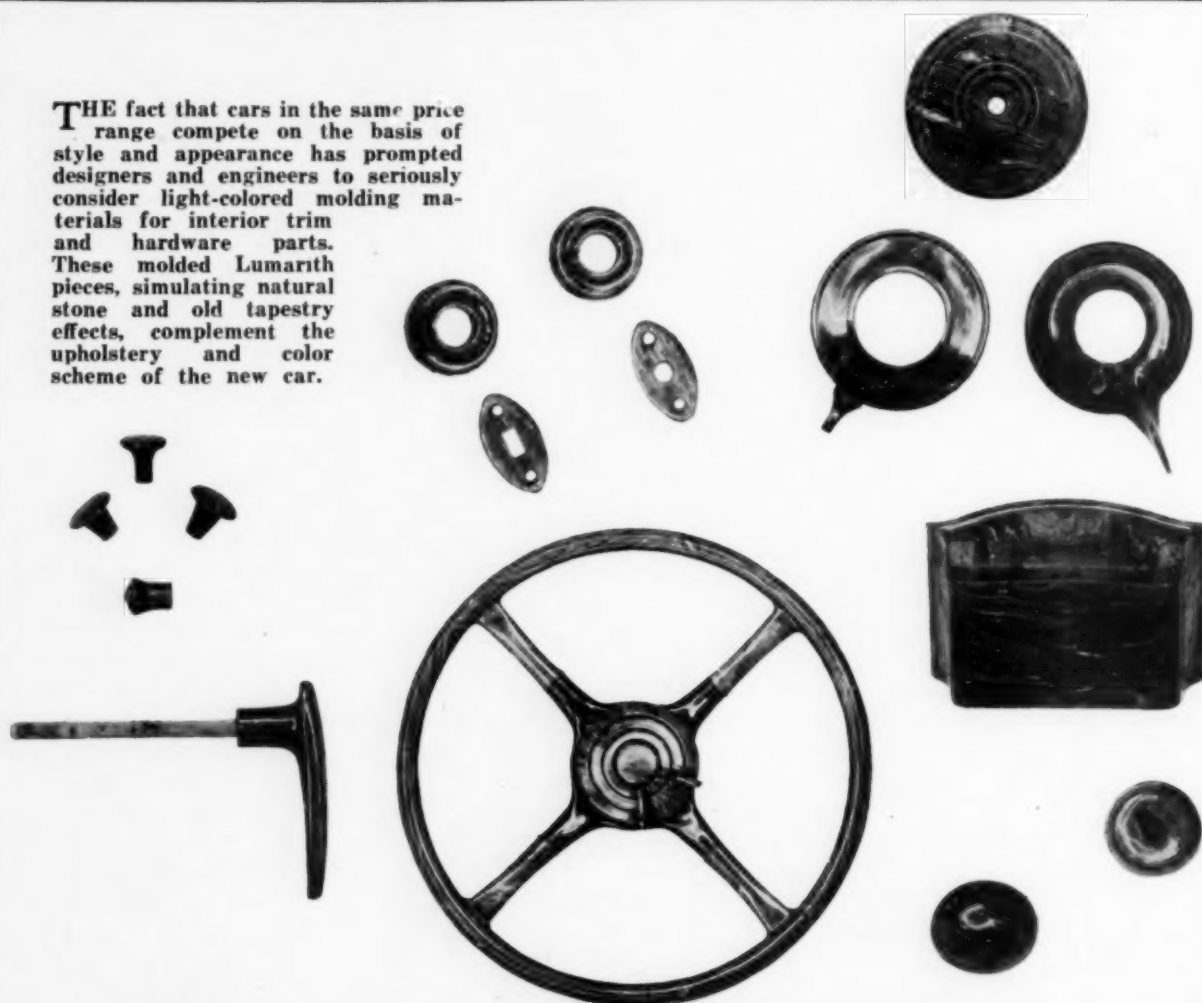
The Season's Forecast

At the recent Auto Salons in Chicago and New York City, colors were more or less forecast for 1931. There was a prominence of the greens and browns, and there was everywhere a

definite leaning toward pastel hues. Some sport models in pastel shades have even included pastel colors on the hardware and steering wheels.

In view of the modern color trends and demands for new and varied effects, the Body Engineers of the various auto manufacturers have readily taken to Lumarite, the cellulose acetate molding material, as a product suited to their needs. Here they can work with color to their hearts content and even obtain reproductions of the natural tones. The technical resources of the Celluloid Corporation are at the disposal of the automotive engineers in working out their problems. It should also be of mutual advantage to the trade molders to keep in close touch with this particular field as the potential possibilities are great and the use of molded parts only in its infancy.

THE fact that cars in the same price range compete on the basis of style and appearance has prompted designers and engineers to seriously consider light-colored molding materials for interior trim and hardware parts. These molded Lumarith pieces, simulating natural stone and old tapestry effects, complement the upholstery and color scheme of the new car.



The Plastics Industry Abroad

Part II; Continued from December "Plastics"

A resume of past accomplishments and the trends of future developments are discussed

By Dr. K. A. Pelikan

Research Chemist; Celluloid Corp.

THE demand for white molding powders in England and France increases, which was to be expected from the success of cast white materials all over Europe. A very lively pace is shown by the different companies engaged in the development and manufacture of resinoids. Bakelite, of course, is established in both countries: in England they transformed the Dammard Lacquer Co., Greet, into Bakelite, Ltd., and in France La Bakelite in Paris supplies the molding with the necessary raw material. England has furthermore, on its list the British Insulite Ltd. (Britsulith, a phenolic material), Birkbys Ltd., Livedge York (Elo, phenolic) Ferguson, Lea Park Works, London (Nestorite Molding Powder), Lorival Mfg. Co., Southall, Middlesex, (Lorival), British Xylonite Co., Ltd. (hard rubber and synthetic resins), Indurite, Ltd., London (Indurite) and of course, among others, the two big hits: Rossiter's Beetle and Dreyfus' Celastoid, which we will discuss in the second part of this article among aminoplastics and cellulose acetate plastics.

French Products

France shows a number of factories and trade-names among the synthetic plastics producers. We do not wish to state that all of these belong to the phenolic family, but we quote them nevertheless: Soc. Nobel Francaise (Agatine rods and Sicalith N), Charles Martin, Levallois (Isoloid), Societe Industrielle des matieres Plat-

tiques (Carbolite Sicoid), "La Syntholite," Soc. anon., Paris (Syntholite) Soc. Roux, Paris (Amiantine), Compagnie Generale d'Electricite (Carnoid, Cegeite) Societe Francaise at Vitry (Coralex), Etablissements Grivolais, Paris (Electroine, Electrolit), Soc. "Oyannoxienne, Oyannaux (Luxalith, Oyocetile, Sc. Bellinite, Bellignat (Novolite), soc. Grandgerar, Perreux, (Stabilite), Soc. de Prod. Chim: La Ronite, Rony-sous-Bois (Ronite).

Three comparatively new and interesting French products may be mentioned: "Thiolite" produced by the Soc. Levy, Samuel and Levy at Joinville-de-Pont (a phenolic resin treated with sulphur chloride). The heat polymerized masses are infusible, hard, non-inflammable, and show remarkable dielectric properties. "Thiobonite" a mixture of hard rubber and synthetic resin, said to be more heat resisting than regular ebonite and of good resistance to alkalis. "Thiojectite" a substance of special value for die casting is molded at high temperature. The manufacturers of the latter two products are not mentioned.

The production of the rest of the European countries, such as Spain, the Balkan countries, Poland and the Baltic and Nordic States does not amount to much. Promising starts are made in several instances, and the Bakelite Co. in Stockholm has found enough followers and customers to warrant her existence but there are still many opportunities for development.

A few months ago "Plastics"

noted that the inventor of a furfural lignin resin had donated his patent^s to the public. This should engage the interest of wood pulp producing countries such as Sweden, Finland and Germany, where enormous quantities of lignin run into the sewers as a waste product. Germany alone eliminates in this way 900,000 tons yearly. The other component, furfural, has not yet become a material of great interest in Europe, at least not to such an extent as in the United States. But if the necessity arises and lignin as a raw material for plastics should become a fact, there is no doubt that chemists on the other side of the ocean will cope with the emergency and find ways and means to produce the necessary furfural if another aldehyde should not prove to be as useful.

The Everlasting Search

The search for new materials and markets and the desire of raising the standard of semi-finished materials developed into an intensive struggle for new chemical starting points. "The pulling force to attract goods, quickly leads the manufacturer back to his sources of raw materials and supplies. He wants to control them; he does control them. And out of the competitive welter comes what is beginning to be termed the "vertical trust"; the concern that owns the entire chain of processes from the gathering of the raw material, through the manufacturing and assembling stages, straight down to the distribution and sale of the

finished product." Compounds such as phenol and cresol were available in abundance and therefore their output could not be pooled by a few manufacturers of phenol plastics with the purpose of excluding new manufacturing units. Raschig in Ludwigshafen is one of the few to use his own coal mines, producing his own phenol and manufacturing his resinoid therefrom.

Scarcer materials were necessary to be worthwhile to interest the chemical industrialists. Materials, which could not be procured by everybody, which needed intensive scientific work before commercial production, and required large capital for their processing and handling; which allowed a decidedly exclusive control of their output.—This idea finds its application in the field of aminoplastics and also dominates the cellulose ester plastics. A few big chemical combines control them. The purchaser of small quantities of urea and thiourea must depend on the half dozen or less controlling forces which determine the prices of these products. The European manufacturer of limited resources may not be able to buy even a few tons of cellulose acetate and transform them into plastic masses should his sources be barred to him. There are not many who do it now. The ultimate effect of this situation is clear. These products can go only one way—the way of all chemical raw materials along the trading paths of the big chemical combines.

The Aminoplastics

It was the strategic position of some of our new plastics which warranted the above considerations. The aminoplastics, among them, shall now be more closely analyzed. F. Pollack in Vienna, was the first to approach transparent urea compounds in a successful manner shortly after the war. Publication of an article about his new "synthetic glass" in the *Chemiker Zeitung* stirred up considerable com-

ment, not the least by his application of colloid chemical theories and practices to resinoid plastic processes. "Pollopas" and its later imitators faced many difficulties during the first years. The problem of proper dehydration of the condensation caused the finished products to develop cracks, starting with fine hairlike scratches on the surface, but often multiplying and in time destroying the whole article. This has been remedied and the fact that the great chemical mammoth concerns such as the I. G. in Germany and Ciba in Switzerland are filing patent after patent along this line should sufficiently prove the value of this material. Pollack, assisted by Prof. Baly, extended his interests to England (Plass, manufactured by British Pollopas Co. Ltd.). France developed "Prystal" through the Soc. Nobel Francaise, Paris, and Barthelmy was active in developing new resins for the Soc. Industrielle des Matières Plastiques.

While these cast aminoplastics made their way from east to west, another product was developed in England on a partly new basis and is now starting its successful way eastward over the continent. It is Beetle, the remarkable ureathiourea molding powder. It filled a gap in the field of white or light-colored synthetic resins. The inventor, E. Ch. Rossiter, developed a whole line of molded colors which until then were difficult to obtain from other materials. British Cyanides Ltd., controlling this raw material by their monopoly of the by-products from the Birmingham gas factories, succeeded in developing a market for this elastic and strong compound. A series of companies are molding Beetle exclusively and trade names such as Beatl, Bandalasta, Beacon, Endura, Birmite, Infuselax, ML, Linga-Longa indicate the expansion of this field. Exports are invading the continent and the Rheinisch Westfälische Sprengstoff A. G. is

said to have negotiated for the manufacturing rights in Germany. Another concern in Germany apparently is starting along similar lines with Albore-sin. We mentioned this product when we discussed the Kontakt-Roemmler Werke.

Other Whites

But a new competitor to Beetle, Kelacoma, was developed in England. It is a urea-thiourea product, combined with a phenolic resin to insure easier flow and "pull," and to give the greatest possible water resistance. The Kelacoma Ltd. in Welwyn, Garden City, offers this molding powder in all shades including white (No. 88) and Ivory White, which compete well with Beetle Industrial White. It will be an interesting study to follow the development of these light-colored products and whether they will cause the revival of a new "white era" for kitchens and bath rooms.

The inventive forces which made for a steady growth in the productive volume and the increase in number of new processes, were not able to lower the reputation and merits of the oldest commercial plastic material. On the contrary, in spite of its age—Hyatt started manufacturing in Newark in 1869—pyroxylin plastics are still going strong. New and competing synthetic plastics sprang up year by year, but chemical improvements and mechanical inventions in the pyroxylin field kept abreast of the new forces. The surplus of idle rolls in the powder factories shortly after the war caused some worry in this industry. But things settled down and new outlets for the pyroxylin stock were opened. Sheets for laminated glass are one of these items, confirming again the remarkable versatility of pyroxylin. The increasing use of films for photographic purposes, especially in the movie industry, further compensated the losses caused by other and cheaper synthetic plastics. The only new pyroxylin producing units starting operation during the past decade

are the Italian plants at Castiglione Olona while during the same period one large unit, Lignose in Germany, has suspended operations.

It would be beside the point to mention here the names of pyroxylin producers in Europe. They are well-known to our trade. But pyroxylin plastics should not be discussed without mentioning Japan's activities in this field. The chief manufacturing places are Tokio and Osaka, but the hub of the output is furnished by one company only; The Dainippon Celluloid Co., Ltd., which produces nearly twice as much as all the others combined.

The Camphor Situation

The camphor monopoly, successfully broken only by the synthetic product of Schering in Germany, is and will at least for the near future be one of the troublesome points of the celluloid industry. The failure of various synthetic camphor processes has been explained by the extreme exactness which is required in control the lack of publications, the lack of trained chemical specialists and capitalists and workmen with indefatigable patience. The Italian efforts, to mention an example of a "nation, anxious to be self-sufficient," were everything but successful. A few months ago, production ceased and the company merged with the Italgas concern in Turin. The output for 1929 was 120 tons of which 90 tons were exported to the U. S. A. Russia just opened her first factory in Leningrad, with a yearly output of 400 tons.

The camphor situation led chemical investigators to conceive the idea of replacing this ideal plasticizer by other equally useful and possibly odorless plasticizers. These efforts are not new, but improvements have only recently become visible. The flood of substitutes the Central Powers were forced to employ in nitrocellulose compounds during the war were soon discarded. The Mollits, Centralits,

and the legion of others lost favor as soon as camphor was available again. Nevertheless, some of the phosphate esters, e. g. the triphenyl phosphate and tricresylphosphate (Lindol) proved their merits as fire retarders and will stay as lasting compounding ingredients with these plastics. The phthalates (Palatinol, etc.) are also widely used. The Deutsche Hydrierwerke (J. D. Riedel, Berlin) have been successful with their adipic acid esters, called the Sipalins and the I. G. recently marketed another compound, the tri-n-butyl-phosphate (Plas-toflex) which really looks very promising.

Enormous as the volume of the pyroxylin plastic business is and in spite of its many useful applications, it could not prevent the rise of a new material which, without endangering the future of pyroxylin plastics rather compensates for some of its shortcomings. Too often the fire hazard of high burning rate of the nitrocellulose compounds have been cited and regretted, and it therefore is easily explained why the industrial research worker looked for a remedy.

We shall omit a discussion of the methods of decreasing inflammability of pyroxylin by the addition of fire retarders in combination with inorganic fillers such as gypsum.

The problem was successfully attacked by a change in the esterification of the cellulose molecule. Nitration was discarded in favor of acetylation. The result was cellulose acetate.

Cellulose Acetate

The acetyl group renders the cellulose molecule almost as readily capable of solution in organic solvents as the nitro group does, removes the fire hazard entirely, and allows the compounder to create similar chromatic effects as he was accustomed to do with the nitro compounds. Eichengruen, the acknowledged pioneer for this "safety plastic," filed the first patent in England for the I. G.

and his Cellit and Cellon respectively are historical achievements.

The road which has been covered between the first efforts and the later successes was long and thorny. Enormous disappointments and vast amounts of money were necessary to build an industry of the imposing and respectful height of today. And even now intriguing problems are luring the chemist wherever he puts his dissecting instruments into the molecular and structural body of this chemical individual: Physico and colloid chemical questions, investigations into proper compounding and plasticizing, processing, etc. require daily and renewed efforts.

Cellulose Acetate Molding

In England, where a few years ago most of the acetate was used for the growing artificial silk industry (Celanese), considerable amounts are now consumed by the plastics industry. The leading concern is the British Celanese Ltd. making Celastoid, the safety plastic in semi-finished shapes as required by the pyroxylin trade, and Cellastine, the molding powder. The interests of this firm have grown considerably by the extension of its interests to the United States, where a controlling influence is exerted over the American Celanese Corporation and the Celluloid Corporation; manufacturing artificial silk, (Celanese) and Protectoid and Lumarith, respectively. Another concern of importance in England, the Acetate Products Corp., offers a series of materials along similar lines, Nacro-lacque, Acetaloid, Cristaline and Molding Powder.

France has several manufacturers for Acetate products: the Soc. des Usines du Rhone (Rhodoid, "The safety plastic"), Soc. des Matières Plastiques (Plastin), Ch. Martin at Levallois (Isoloid), Soc. Nobel (Sicalite), Soc. Celluloid-Petitcollin-Oyon-nithe (Sicoid, Oxyetyle, Ace-loida) and Soc. de Prod. Chim.

(Continued on page 38)

Casein Plastics Re-Appear in the American Patent-Art

Some recent inventions that demonstrate that these proteid plastics are again engaging the earnest attention of inventors

CASEIN solids and plastics, after having been made along more or less orthodox lines since their discovery about forty years ago, and having been the subject of but relatively few patents in recent years, appear to have been interesting inventors during the period of five years past, as a number of patents are now appearing, all bearing filing dates from 1924 to 1928.

The processes described deal mainly with the molding of casein articles, by which is meant the production of the finished articles in their final form without the intervention of machining operations.

Molded Products

For example, Lynford A. Apple, of Glen Ridge, N. J., describes the molding of Casein buttons from either **uncured** rods or sheets of extruded casein. A correct understanding of his method requires a reference to his drawings, which are taken from U. S. P. 1,765,819; June 24, 1930 (filed May 2, 1927).

In the accompanying drawings, the method is shown as applied to the manufacture of buttons or similar articles. Figs. 1 and 2 show a plan and sectional elevation, respectively, of a female die used in carrying the invention into effect, while Figs. 3 and 4 illustrate the complementary male die; and Figs. 5 to 7 illustrate the successive steps in forming the articles and ejecting them from the dies.

The female die has stationary forms 8 inserted in the die plate 9 and secured to a bottom

For quite a while the resinoids fairly jammed the stage and "hogged" the spotlight of the inventive art in the domain of modern plastics.

The present series shows plainly that much remains to be done with proteid plastics—and our inventors "are glad of it."

plate 10 by screws 11. The male die has slidable forms 12 provided with shoulders 13. These forms are inserted in a die plate 14 and are held in place by the recessed bottom plate 15, the depth of the recess in the plate 15, being greater than the height of the shoulders 13 by the amount of movement desired for the forms 12.

The casein, as it comes from an extruding machine, is in the form of rods or bars which are immediately cut up into slugs 16. Each slug 16 is long enough to extend across one row of the forms 8 in the female die. The male die is then placed in registration with the female die by means of the guide pins 17 carried by the female die and the holes 18 formed in the male die, as shown in Fig. 5. It is not, however, essential that the buttons be made of slugs of the kind just described, for they may be made from a sheet of casein covering all of the forms 8.

When the male and female dies have been brought together with the plastic material between them, they are placed in a suitable press having platens which may be heated by steam and cooled by water circulation.

Such presses are used in the manufacture of casein by other methods, though in a different way.

As soon as the dies have been placed in the press, heavy pressure is applied to the same, the surplus material being driven out into the space 19 between the die plates 9 and 14 leaving only a very thin film of material in the spaces between the individual forms, these spaces being exaggerated in the drawings, in the interest of clearness. A few seconds after the casein has been pressed into the form shown in Fig. 6, steam is turned on the platens of the press and the heat therefrom communicated to the buttons now formed and still under pressure. After the heat has been thus applied for a few moments, the steam is turned off and cold water is circulated through the platens of the press, which of course cools the dies contacting therewith, and they in turn cool the buttons still under pressure, the whole operation—in the case of buttons—being completed in a few minutes. The advantageous results obtained by this sequence of steps may be noted at this point. By molding the casein while it is cool and then heating it while still under pressure, the customary polishing and finishing operations on the molded articles are rendered unnecessary, as the result of this sequence of steps is the production of articles, the surface of which is as smooth or polished as the surfaces of the molding forms used. This is due to the internal pressure developed in the casein by operation of its

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high coefficient of expansion, the material being expanded by the heating step while still under pressure in the molds to provide the smooth surface. By the final step of cooling the molded articles while they are still under pressure, the material contracts sufficiently to free the material from the molding forms and without warping either during the cooling operation or thereafter.

When the buttons have been formed, as in Fig. 6, they are connected only by a very thin film of casein, the space between the die plates 9 and 14 being exaggerated in the figure. This film is only a few thousandths of an inch thick, and it occurs at the junction line of the lower surface and the perimeter of each button, so that the only die-mark there is is coincident with a corner of the button where it is not distinguishable from the corner itself when the

buttons are finally broken away from this thin film. The formed casein having been embedded in the holes in the plate 14 by the recession of the forms 12, as shown in Fig. 6, the ejection of the formed buttons after cooling is accomplished by removing the female die and pushing the forms 12 of the male die down by means of an ejector 20, having pins 21, registering with the holes 22 in the recessed plate 15, the male die being supported by a suitable frame or box 23 during this operation, as shown in Fig. 7. When the shoulders 13 of the forms 12 reach the plate 14, the formed buttons are freed from the male die and drop into the box 23.

In performing the operations illustrated in Figs. 5, 6 and 7, the actual position of the dies is of course immaterial as long as their relative position remains the same. These opera-

tions, therefore, may be performed equally well in the positions obtained by inverting Figs. 5, 6 and 7, respectively.

The buttons or other articles made by this method require no further finishing operation unless it is desired to cure or harden them, which may be done in any of the ways already known, as by submerging them in formaldehyde for a long period without pressure, or for a much shorter period under pressure.

A Really Plastic Casein Product

DIFFERING from the usual accepted types of casein plastic is a composition described by William W. Christmas, of Ridgefield Park, N. J. It comprises a mixture of casein with alkaline-earth solvents and fillers. As described in U. S. P. 1,758,500; issued May 13, 1930, (filed however June 9, 1924), the product is made from:

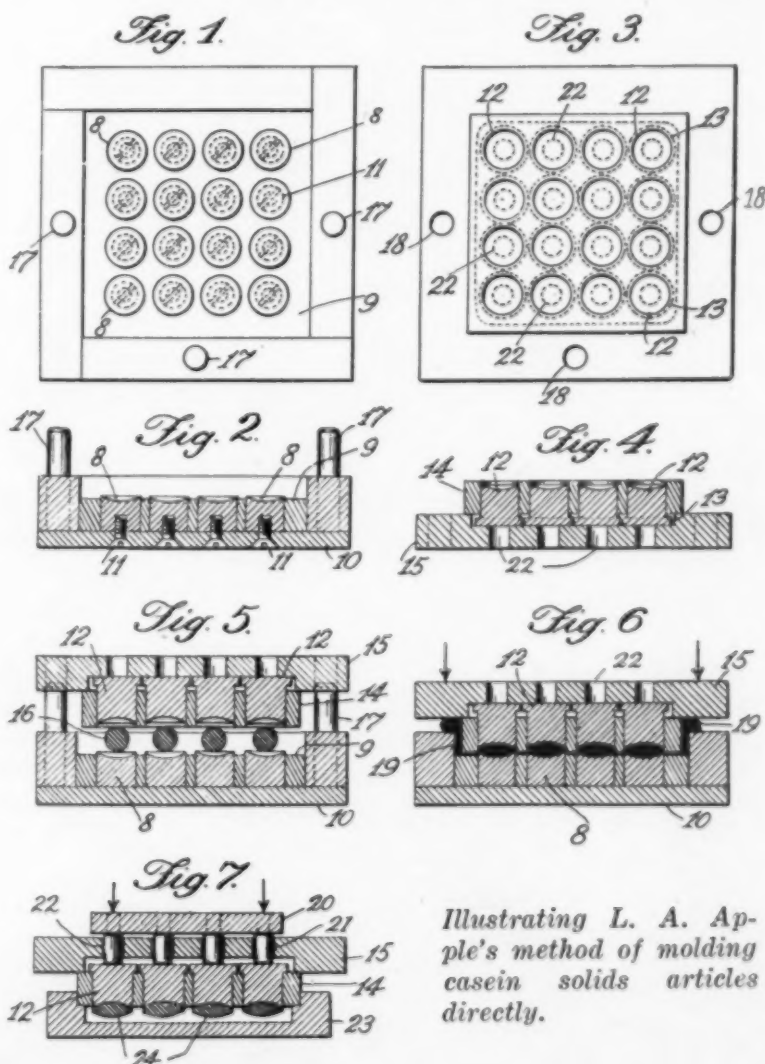
Powdered Casein	1 pound
Powdered calcium hydroxid	1 pound
Calcium carbonate or whiting	1 pound
Marble dust, sand, fuller's earth, asbestos, ground oyster shells, or other fillers, singly or mixed ..	3 pounds
Glacial acetic acid	1/2 ounce
Sawdust, wood flour, or powdered wood pulp	3 pints
Water in sufficient quantity to produce a free flowing mass.	

The following may also be used:

Powdered casein	1 pound
Powdered calcium hydroxid	1 pound
Calcium carbonate or whiting	1 pound
Marble dust, sand, fuller's earth, asbestos, ground oyster shells, or other filler, singly or mixed ..	3 pounds
Powdered calcium stearate	1 ounce
Sawdust, wood flour, or powdered wood pulp	3 pints
Water in sufficient quantity to produce a free flowing mass.	

The compounding of the ingredients is effected as follows:

The casein is soaked in water; the powdered calcium hydroxide is mixed with water, and the calcium carbonate or whiting is mixed with acidulated water, namely, a solution of water and acetic acid, the former in quantity sufficient to thoroughly saturate the whiting and the latter in the quantity hereinbefore stated. The calcium hydroxide and water mixture is then added to the wet casein and thoroughly mixed, after which the calcium carbonate or whiting and acid mixture is added, and the resulting mass thoroughly mixed; the marble



Illustrating L. A. Apple's method of molding casein solids articles directly.

dust or other filler, or mixture of fillers, is then added, and the sawdust or wood flour finally added just before using. After the addition of each component, the mass is thoroughly mixed to insure a uniform distribution of each ingredient, and stirring should be continued until all free carbon dioxide is removed. Any suitable coloring matter, such as a dye or stain may be added before or after the addition of the filler, or the filler may consist, in part, of such coloring matter, for example, paint colors, lamp black, etc. Before the addition of the sawdust, sufficient water should have been present to prevent premature setting, and to provide a sufficiently fluid mixture to enable the thorough distribution of the sawdust, and produce a dough-like plastic mass. The sawdust should not be added until just before using. The thoroughly mixed mass may be applied with a trowel to different types of surfaces, or may be added to molds under varying degrees of pressure; or may be passed through rolls or dies to produce objects of different shapes, such as mouldings, panels, etc., or be applied as a coating to other articles, to render them water- and fire-resistant.

Polished by Pressure

The composition containing the calcium stearate, either with or without acetic acid, is prepared in the same manner as the acetic acid composition, except that, in the absence of acetic acid, there will be no evolution of carbon dioxide. The final composition will have substantially the same properties.

The casein and calcium hydroxide together form a casein glue, and this is thoroughly disseminated throughout the mass of the plastic. During the drying process, which may take place slowly or rapidly, an induration of the casein glue sets in, which tenaciously binds its component parts, and the surfaces to which it has been ap-

plied in a uniformly dense and hard mass, which strongly resists fracture, or separation from the surface to which it has been applied. By suitable pressure, or other treatment, a high polish may be given to the articles produced, and coatings of various colors may be baked upon it, as in the well known japan and enamel coating processes.

The use of calcium carbonate (whiting) in this composition, with or without the acetic acid, is of importance, as it acts to greatly increase the adhesiveness (tenacity) of the casein glue. The use of acetic acid in combination with the whiting, whereby a certain proportion of calcium acetate is formed, adds to this action, that is to say, further increases the tenacity of the glue, providing a composition which will stick to wood, glass, concrete and other dissimilar surfaces so firmly as to practically render it an inseparable part of the material to which it is applied.

Another Molded Casein Product

REALLY plastic articles form casein, whereby the casein is kept moderately plastic for some time form the high-point in a process, perfected within the past two years by Joseph G. Davidson and Ernest W. Reid (assignors to Carbide and Carbon Chemicals Corporation). An application on their invention was filed January 3, 1928, and matured into U. S. P. 1,772,131 on Aug. 5, 1930.

In the manufacture of moulded objects from casein, the process consists in the operations of separating the casein from milk by a sequence of steps, well known in the art, and an appropriate purification by processes which are also well known. The raw casein material from these steps is available in the form of a granular white powder. By the use of various plasticizing means, this material has been formed,

either with or without coloring materials into various useful objects, by a plastic moulding operation. Difficulty has however been encountered in the moulding because of the lack of fully satisfactory plasticizing agents. Water alone has been used to plasticize the casein, and it produces a sufficient degree of plasticity, but it dries out with an undue speed, and in the drawing there is a tendency for the moulded article to crack and check. Various of the alkalies have also been used, in combination with water, but they likewise are unsatisfactory because of the fact that they introduce various impurities into the casein.

The invention provides a new and useful plasticizer for casein, which when mixed with the casein produces a very satisfactory degree of plasticity, which is retained for a desirable length of time, and which avoids the difficulties from cracking and checking, previously encountered, and consists in the preparation of a plastic casein mixture containing an organic base as the plasticizing agent, such as triethanol-amine



or mixtures consisting of triethanol-amine, other ethanol amines and ethylene di-amines. The suitable substances are organic bases, such as amines, or substituted ammonias or amido compounds, diamines, etc.

Tri-ethanol-amine as a Plasticizer

In preparing a casein plastic according to their invention, they take a suitable amount of the dry pulverized casein, and mix with it a suitable proportion of water, and a suitable proportion of the organic base, such as the tri-ethanol-amine, either with or without the other ethanol amines and with or without ethylene di-amine. The water may conveniently be present to the extent of about 5% of the amount of the casein, and may be varied over a substantial range, either above

(Continued on page 49)

NEWS of the INDUSTRY

Hercules Powder Co. Achieves Unusual Safety Record

AN unusual safety record has been established by the Hercules Powder Company during the month of November 1930 in operating all of its plants throughout the country without a lost time injury to anyone.

This record is unique when it is considered that the Hercules Powder Company's operations consist of 10 explosives and heavy chemical plants, two naval stores plants, one cellulose and one nitrocellulose plant, five woods camps, and one Experimental Station. Although individual plants have made excellent records for themselves and maintain a high safety standard, it is the first time in the history of this company that all twenty units (employing 2805 workers) have operated the same month without a lost time accident.

Hercules Powder Company Declares Quarterly Dividend

THE regular quarterly dividend of 75c on the common stock of the Hercules Powder Company was declared today by the Board of Directors. The dividend is payable Dec. 24 to stockholders of record Dec. 12. There are 603,079 shares of common stock outstanding.

Hoffman of Goodrich Now With R. & H.

H. A. HOFFMAN, formerly with the B. F. Goodrich Company, and more recently chief chemist of the Mason Tire & Rubber Corporation, has joined the technical organization of The Roessler & Hasslacher Chemical Company.

After spending several years in the laboratories of Eli Lilly

Nema Meeting

THE next meet of the Molded Insulation Section of NEMA will be held on Friday, January 16th, at 9:30 A. M. at the Hotel Statler in Buffalo, N. Y.

& Company of Indianapolis, he joined the technical staff of the B. F. Goodrich Company in 1910, and has had a long and varied experience in compounding and developing all kinds of rubber goods. At Goodrich he had charge of various divisions of the Development Department, including the Raw Materials Division. This division was concerned in the development, selection and practical application of rubbers, reclaims, pigments and chemicals for use in the plant, and was also in close touch with the commercial angles pertaining to crude rubbers and rubber compounding materials.

Mr. Hoffman was born and educated in Indiana, but since 1910 has lived near Akron and is well known in technical circles in that vicinity. He will act as a technical representative of the Rubber Division of The Roessler & Hasslacher Chemical Company in the Akron and midwestern districts.

Pyralin Displays Toilettware at Atlantic City

THE Christmas shopping season at Atlantic City was represented at the Du Pont Products Exhibit by a Boardwalk window display of the new 1930 patterns of boudoir accessories, developed by the Du Pont Viscoloid Company. The new sets suggested as gifts include the Adam, Trianon, Monticello and Fleuret designs in Lucite and the new Lustris and Madelon pat-

terns in Pyralin. These new boudoir accessories have been created by well-known artists and stylists.

Redman Elected 1932 President of the A. C. S.

IN accordance with the new policy of the American Chemical Society, at the recent election of officers for 1931, officers for 1932 were elected on the same ballot. Dr. L. V. Redman, vice-president and director of research of the Bakelite Corporation, was honored by election to the office of president of the Society for 1932.

Allan Brown Chairman of N. I. A. A. Committee

ALLAN BROWN, Advertising Manager of Bakelite Corporation, and first Vice-President of the N. I. A. A. has been appointed chairman of a committee to prepare the program for the spring convention to be held May 4-6 at White Sulphur Springs, West Virginia.

New Laminated Stock

THE Mica Insulator Company, New York City, announces a new line of resinoid laminated sheet stock under the trade name of Lamicaid. It is made in 16 grades, all having a paper base, and with a wide range of mechanical and electrical properties. Colors are black, brown and natural and three wood-imitation effects for decorative purposes.

Argentine Casein Exports Decrease

THE total exports of casein from Argentina in 1929 (data are preliminary and subject to revision) amounted to 36,613,997 pounds, valued at \$3,475,755—a drop from the 38,787,732 pounds, worth \$3,734,371, shipped out of that country in 1928.

General Plastics Issues

New House Organ

VOLUME 1, Number 1, of "The Durez Molder," house organ of General Plastics, Inc. made its first appearance just before Christmas. The little booklet is offered as a means of "keeping alive that spirit of service and good fellowship to advance mutual interests." In addition to the racy commentary of General Plastics' genial advertising manager, H. S. Spencer, with which the booklet is generously interspersed, the above-mentioned spirit is well exemplified by the following reprint from the booklet:

Higher Freight Rates Continued

"Durez molding compound shipped as Synthetic Gum or Resin Compound has had the classification, third class in less carloads, fourth class in carloads. For three years the carriers have been attempting via Consolidated Classification Committee, to change this classification—raise the rate.

General Plastics has appeared at the various Consolidated Classification Committee hearings and protested these proposed increases. The last attempt of the carriers to change the existing rates appeared in Consolidated Classification Committee Docket No. 40 of January, 1930 where it was proposed that the rates be changed from third class carload to second class less carload and from fourth class carload to Rule 26 carload. Rule 26 is a rate twenty percent lower than third class but not lower than fourth.

Our traffic representatives protested this proposed increase at the Classification Committee hearing, New York January 17th, also at their hearing, Chicago, January 23rd.

In September 1930, the carriers announced in Consolidated Freight Classification No. 6, Supplement No. 6, that effective

October 15th, 1930, the rates on Synthetic Gum or Resin Compound would be changed from third class less carload, to second class less carload and from fourth class carload, 30,000 pound minimum.

We immediately (September 20th) filed request for suspension protesting this increase until a hearing could be held before Interstate Commerce Commission. Request for postponement being denied October 13th, we prepared a formal complaint and presented it to the Commission October 31st, 1930 and forwarded copies through the Commission to the forty-five separate carriers who would be favorably affected.

This complaint which is No. 24054, clearly showed the unreasonableness and injustice of the increased rates in violation of Section 1 Interstate Commerce Act and that just and reasonable rates and regulations prescribing the classification of Synthetic Gum or Resin Compounds, N. O. I. B. N. would prescribe classification ratings not in excess of third class less carload and fifth class carload and fifth class carload on minimum of 36,000 pounds.

The result of this complaint—we will be heard by the Interstate Commerce Commission, General Plastics being represented by Traffic and Legal Counsel will attempt to obtain the lower rates.

This is a resume of what has actually happened, not of what we are going to do but what has actually been accomplished to date. We are the only manufacturers of Synthetic Gum or Resin Compound who have filed a formal complaint with the Commission, protesting the increases in rates, although all other manufacturers involved will benefit by any reduction obtained by us. Purchasers of com-

pounds should save their freight bills as they will be entitled to adjustment on present rates."

R. & H. Gives Safety Show at Niagara Falls Theatre

ACCIDENTS in plants do not simply happen. They are generally the result of one of two causes: either unsafe conditions in the plant or a careless attitude of the employees," said L. M. White, Assistant Superintendent of the R. & H. Chemical Co., in addressing employees and their families at the Safety Show. The Show, held in the specially chartered Capitol Theatre, December 16, 17 and 18, was featured by a special safety program. Motion pictures were shown and awards made of silver cups and certificates to winning departments.

British Plastic Trade Notes

By A. C. Blackall

A SIGNAL honor has been done the plastics trade by the election of Edwin Thompson as Lord Mayor of Liverpool. Lord Mayor Thompson is governing director of Thompson & Capper, Ltd., this firm having been originally started by his great-grandfather, Thomas Thompson, in 1798. The firm supplies a large amount of machinery to the molding industries, especially for the purpose of pelleting molding powders. In addition, it does a considerable pelleting trade for other molding firms. Mr. Thompson has served on many important committees of the Liverpool City Council and is chairman of the Water Committee. This year he has also been elected President of the British Waterworks Association. He was honorary secretary of the British Association for the Advancement of Science, one of the world's most famous learned bodies, when it met in Liverpool in 1923.

British Celanese

DR. Henry Dreyfus announced at the eleventh general

meeting of British Celanese, Ltd., that the board had decided to pay the current half-year's dividend on the first preference shares, but had felt justified in deferring payment on the second preference shares. Dr. Dreyfus declared that the company was in a stronger position than ever before, and the progress it has made in a difficult year augurs well for 1931. The Chairman further stated that in addition to an improvement the company's products there had been substantial reductions in production costs, with the result that the company is now able to compete with any concern selling at an economic price.

A valuable lecture was delivered recently by Jabes Taylor, of Kelacoma, Ltd., to the Working & District Ironmongers' Association and their Guilford colleagues. Nearly 100 members listened to "The Possibilities of Molded Products of the Plastics Industry in the Hardware Trade." Mr. Taylor briefly described the manufacture of the various plastic materials, such as casein, cellulose, phenol, and urea resins, and the use of various fillers and binders. He also exhibited various moldings made from these materials, and succeeded in convincing the audience that molded products should play a greater part in the hardware industry than is the case at present.

A new British patent taken out by the Italian firm of Magnasco, Roggero & Co., Genoa, claims that by treating "formed" cellulosic material successively with an alkali and an acid solution, a product is obtained which, when impregnated with the components of an artificial resin, and then submitted to the resinifying process, and finally pressed and heated, furnishes a material showing the texture of the original fibrous material employed.

(Continued on page 34)

Peek Becomes Chief Engineer of Pittsfield General Electric Works

F. V. Peek, Jr., has been appointed chief engineer of the Pittsfield, Mass., works of the General Electric Company, effective January 1, it has been announced by E. A. Wagner, manager of the works. Mr. Peek succeeds Guiseppe Faccioli, who retired a few months ago from active participation in the affairs of the company because of ill health.

Mr. Peek, who has been a consulting engineer of the company at Pittsfield, entered the General Electric Company "on test" in 1905, following graduation from Leland Stanford University in the same year. When the consulting engineering department was formed by Dr. Charles P. Steinmetz in 1909, Mr. Peek was one of the first to join it. Since then he has done general consulting work on practical and theoretical engineering problems and research work. In 1911 he received the degree of Master of Electrical Engineering from Union College for work done in connection with high-voltage transmission.

In 1916, to keep in better contact with the development of high-voltage transmission and engineering, Mr. Peek went from Schenectady to Pittsfield where the high-voltage laboratory is located. Probably the best known research work of Mr. Peek is the formation and establishment of laws regarding corona, the investigation of lightning and its effects on high voltage transmission, the study of dielectric phenomena, line insulations and the problems connected with the transmission of high-voltage currents.

Mr. Peek is the author of more than 200 papers in different scientific and engineering publications. Inventions relating to high-voltage insulations, transmission lines, lighting arresters, electrochemical subjects, etc., are credited to him.

Better Business Begins

By H. S. Spencer

WELL, business is going to be better. Here's Roger Babson, bullish for the first time in four years.

Now Babson knows his stuff, "Believe it or not," and "I'll tell you why." Years ago I was getting experience, very general experience out West. It was one of those outfits out that way that owned three factories, the town hall, the water supply, the national bank; well the only thing that wasn't theirs, was the post office and the freight depot, and the whole outfit was run by two sons of an old pioneer—a hoary old fellow who cut down native timber and sawed it up, made furniture out of what was any good, and caskets out of the rest. Well, the boys grew up. "C.D." was my boss and he was shrewd—yes, downright shrewd and knew a lot of things that city salesmen didn't expect to find in a small town, tobacco chawin', coat and collarless man, behind a disorganized desk in the middle of the general office. These city fellows invariably left wiser, if not sadder men.

"C.D." believed that someone got the best of every deal, and that it was just as well to believe that it was the other fellow. Also, that he wasn't always honest, so why take a chance and give him credit for being so. He was successful, that is the business had grown and prospered under his hands, through two wars, several panics and market depressions, democratic administrations, 'n' everything.

Now, he was a reader of Mr. Babson's reports, but unlike most of us, he didn't just read them; he studied them—and I have known him to disagree and would tell Mr. Babson of Boston that he was wrong. Well I did not know Babson, but I'd put my poke on "C.D."—I worked for him.

Business is going to be better, if both of these fellows say so.—From "The Durez Molder".

Molders Organize For New Year At December Section Meeting

Bakelite Corporation acts host to group at dinner in Hoboken after meeting

SEVENTEEN Member Companies were represented at the most recent meeting of the Molded Insulation Section of the National Electrical Manufacturers Association. This meeting was held at NEMA offices, 420 Lexington Avenue, New York City on December fifth, and was called to order shortly after ten o'clock by the new Chairman of the Section, Louis G. Sylvester. The following were present:

Members

American Insulator Corp., Prescott Huidekoper.
American Record Corp., L. G. Sylvester, R. A. Allen.
Auburn Button Works, Inc. Douglas Woodruff.
Boonton Molding Co., L. L. Stratton.
Boonton Rubber Mfg. Co., Ronald Post, P. C. Goodspeed.
Bryant Electric Co., C. A. Bates.
Chicago Molded Products Corp., L. H. Bachner.
Diemoulding Corp., Donald Dew.
General Electric Co., H. D. Randall, T. E. Giblin.
Kurz-Kasch Co., C. A. Kurz, Jr.
Mack Molding Co., Donald Kendall, Mr. Howell.
Monowatt Electric Corp., R. E. Coleman, F. J. Groten.
Northern Industrial Chemical Co., B. E. Schlensinger.
Norton Laboratories, Inc., J. B. Neal.
Reynolds Spring Co., J. G. Rostirer.
Shaw Insulator Co., F. H. Shaw.

Guests

Niagra Insul-Bake Specialty Co., K. C. Ogden, Ronald Kin-
ner.
NEMA, E. S. Aumend, T. W. Howard.
Accountant, J. J. Quigley.
Plastics Publications, Inc., R. C. Gilmore, Jr., Nicholas Klein.

Mr. Schlesinger, the Secretary, read the minutes of the previous meeting of the Section, and these were approved by those present. Then Mr. Sylvester, as the first duty of a new office holder, gave an address to the members in which he stressed the potentialities of the Industry with increased outlets and markets and the prospect of growth that lies ahead. It was a fine talk, filled with a common sense view of the future, and, in closing, Mr. Sylvester cited Clarence Collens' Address (printed in December PLASTICS) as a personal code of ethics for the business man. Copies of this address were available at the meeting.

Kurz Voted Thanks

A rising vote of thanks was given to Mr. Kurz, the previous Chairman, for his untiring and successful efforts in bringing the Section from its inception through its embryonic stage to its present strong position. Upon vote, the Section expressed its desire to continue with the work on uniform accounting, and Mr. Howard, who is in charge of this branch of the activities, gave an excellent talk on the work accomplished to date and the plans for its continuation. Undoubtedly there is much to be gained from such effort, and Mr. Howard and his associates are to be congratulated on the success of their efforts to date. Mr. Rossiter next presented the report of the Trade Extension Committee, and although this cannot in turn be presented to our readers at this time, it was learned that specific recommendations were made covering the coming year, that these were passed, and that

within the next six months definite action will be taken.

Mr. Sylvester then discharged all the present Committees with thanks for their efforts during the past, and appointed the following:

New Committees

Advisory Committee: L. G. Sylvester, Chairman; H. D. Randall, S. M. Stone, B. E. Schlesinger, Douglas Woodruff.

Uniform Sales Contract Committee: F. H. Shaw, Chairman; L. L. Stratton, J. B. Neal, J. Fuller.

Trade Extension Committee: J. G. Rossiter, Chairman; R. A. Allen, J. B. Neal, L. L. Stratton, F. H. Shaw.

Membership Committee: C. A. Kurz, Jr., Chairman; L. H. Bachner, Donald Dew, Prescott Huidekoper, R. E. Coleman and also appointed Mr. G. V. Sammet of the Northern Industrial Chemical Company to the Chairmanship of the Uniform Accounting and Cost Estimating Committee, thus providing a necessary link between this committee and the members of the Section.

There was no further new business to come before the meeting, so the date of the next one was set for January 16, 1931 at the Hotel Statler, Buffalo, New York. This meeting to begin at ten A. M. sharp.

Dinner at Hoboken

After adjournment most of those present journeyed to the wilds of Hoboken for a typical Hoboken dinner that was furnished by the Bakelite Corporation. Here some new faces joined the party—new, that is, be-

(Continued on page 34)



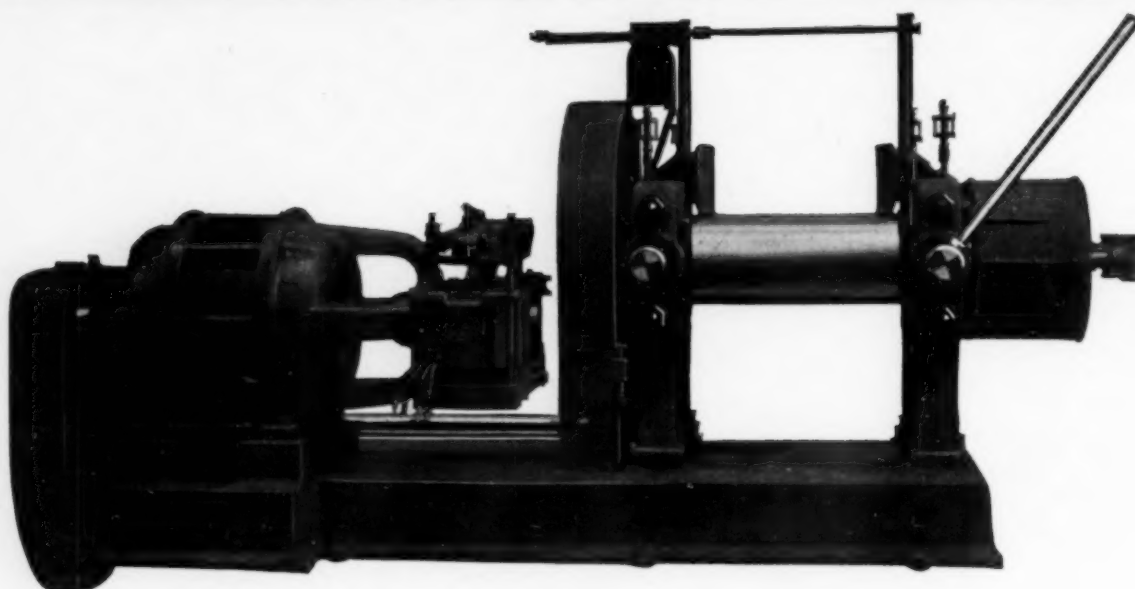
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Presses—Cake (Hydraulic)
Presses—Platen (Hydraulic)
Presses—Polishing (Hydraulic)
Rolls—Converting
Rolls—Mixing
Rolls—Sheeting
Safety Clutches for Rolls
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THE 10" x 20" Individual Motor Driven Mill here illustrated was designed especially for laboratory use but is equally well adapted for production in the factory where output is small.

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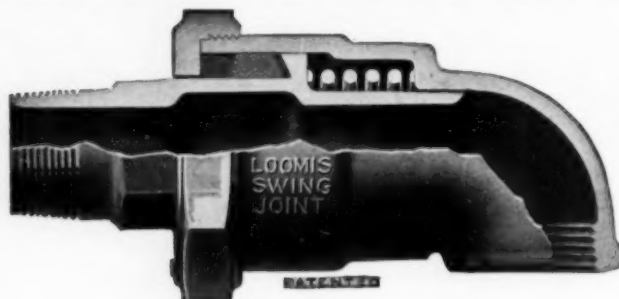
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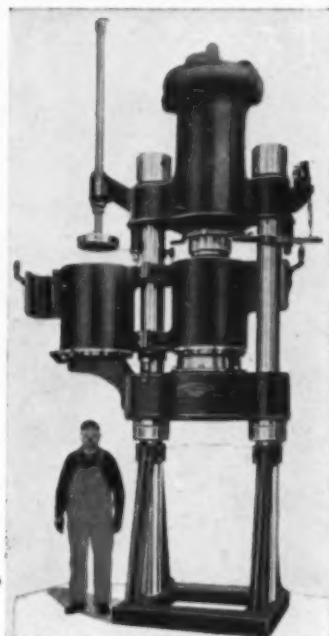
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JACKSON, MICHIGAN**



**BAKELITE
LUMARITH ALDUR**

NEMA Meeting

(Continued from page 30)

cause they had not been presented earlier in the day. Among these were Bob Dodd, Herb Spencer and Landsheft of Durez; the Three Brown Brothers (without saxaphones)—Allen, Sanford and Gordon, all of Bakelite; Clint Bunt, also of Bakelite. We can assure you that as long as we were present—which the "Little Helper" tells us was long enough, there was plenty to do and to be done, and we understand there was even more after we left, though through no fault of ours. We did stay long enough to receive one of the "Read 'em and Weep" boxes given by the hosts and to indulge briefly in its manipulation. Enough said.

British Plastic Notes

(Continued from page 29)

The "formed cellulosic materials include wood shavings, grasses, tree barks, leaves, woven fabrics, etc. The following example of the process is given.

Mixed mahogany and walnut wood shavings (100kg.) are steamed in an autoclave with 1 per cent caustic soda solution for three hours at a pressure of 2 kg. per square cm. The mass is washed with water, dried, and soaked for 24 hours in a mixture of equal parts of 5 per cent aqueous sulphuric and nitric acids. After again straining the product is brought to a weak alkaline reaction (pH8) by adding ammonia solution, surplus moisture is removed, and the mass mixed with 50-65 kg. of carbolic acid; sufficient formaldehyde is added to form a potentially reactive resin with the phenol, together with the required amount of neutralizing base, and reaction is allowed to proceed for 24 hours. The aqueous liquid is removed and the fibrous gummy mass is dried, first by centrifuging and finally in a current of air at 60° C.; p-dichlorobenzene and hexamethylenetetramine are then incorporated.

The Hazards of Molding and Merchandising Proprietary Numbers

By H. S. Spencer

Advertising Manager, General Plastics, Inc.

THERE are so many uses for molding material, so many attractive fields of development for these materials, the manufacturer of them and the custom molder likewise is often puzzled where to go for business.

If he is the manufacturer of raw materials of experience, he makes a study of the situation, a survey of the various possible uses for his material and proceeds to develop the most likely markets. If he is a custom molder of compounds he should do the same thing, combining or considering his previous experience and type or class of molding that his organization is best equipped to do, both by experience, training and equipment.

For instance, a molder working on electrical parts, who has an engineering training, would in all probability be more successful by concentrating upon electrical or similar parts than he would be if he tried to step over into novelties, toys, pencils, etc. Of course, he could not afford to neglect or to overlook entirely this diversified business if it came his way but he should be cautious and certain that he secured such business at a satisfactory profit, for his place to meet competition is on his own ground; and by concentrating, he can do a better sales and advertising job in one field than he could possibly do in a number.

For example in the electric appliance field, as long as we have used electrical, a reasonable amount of advertising could be done and it could be made to quite definitely set up an organization as specialists in the molding of electrical parts, whereas

the same sum devoted to several fields, would in all probability be lost.

This single field idea can, of course, not be drawn too fine. For instance, a molder confining his work to the automotive industry or radio entirely, might find himself in a sad plight when the slack period in the industry in which he specializes occurred, but he will be wise if he studies the lines he is most familiar with and puts his greatest sales effort there.

A dangerous reef for molding navigators are the strange waters of the proprietary lines. Oh, sailor, beware, BEWARE, it's a rocky road, though we draw our word picture at sea.

Proprietary articles need merchandising, advertising — they have to be sold. Invariably the proprietary article is the joyous though hard work of someone who conceives a clever device. He enthuses. The article is made. His partner, friends and organization get pepped up and production is started in a small way. Some sales are secured.

Christmas or seasonal business, he often estimates as indicative of what he can do the year around.

Enthusiasm increases. Some dealers are stocked. Several distributors are located and promise orders. They get some small ones. Greater production is planned. A stock is built up. Some advertising is started, written by the space salesman for the publication. It's good advertising but repeat orders are slow, few and far between. Why? There's a dozen reasons why, maybe two dozen. Let's say one is that no investigation was made to see how Mr. and

Mrs. John Doe liked this contrivance which we were going to sell. What faults they found with it.

Let's check up and see if the price was right. It wasn't if two or three competitors bring out almost duplicate contrivances at one-third the cost.

These suppositions are not theoretical. This very thing did happen with an automobile device within the last year, and with a number of other very definite examples that could be cited.

In bringing out the proprietary number, it is important to find out what dealers think of it. Will they stock it merely as a number that there is an occasional demand for, or something that they can push and make money on? Will distributor's salesmen get enough out of it to push it over and above the 200 other items in their catalog, or will he merely accept orders for it. If the latter is so, someone must create a demand for it. Proprietary or special numbers entail study — investigation.

The idea for an article may be very clever. The finished product may look good. It may even have a worthwhile use. The manufacturing problems may be all solved. Getting cash for the product, selling it, however is merchandising and the greatest of the problems that confront the manufacturer making most everything. It is the rock in the path of the molder of proprietary numbers.

Proprietary numbers can be profitably made and sold but the process is not as simple as it appears on the surface.

Strong Calcium Thiocyanate Solutions Replace Zinc Chloride in Making Vulcanized Fiber

Gelatinization Takes Place After Immersion

VULCANIZED fiber is an article closely related to many of the plastic materials. Comparatively little work has recently been done on this product, which finds very wide application in the electrical industries.

A namesake of the inventor of the steamboat contributes the following invention. He is Robert R. Fulton, assigner to Robert Koppers Company. According to his U. S. P. 1,767,662, (filed March 16, 1917, issued June 24, 1930) he proceeds as follows:

This invention relates to the treatment of cellulose to gelatinize or dissolve the same. The invention has particular application to the production of vulcanized fiber, imitation parchment and the like.

The Old Process

At the present time, the manufacture of vulcanized fiber is generally conducted according to the well-known zinc chloride method. According to this process, a certain grade of cotton rag paper is subjected for a few seconds to the action of a 70° Baumé solution of zinc chloride at a temperature of about 50° C. After this treatment and while the paper retains some of the solutions, the paper is rolled upon a large heated drum and is subjected to a slight pressure from an adjacent roll. When the desired thickness is obtained, the spongy mass is cut from the roll and placed flat on a table or the like for a short time to assume the proper form. It is then placed on edge in a dilute solution of zinc chloride. Subsequently, the treated fiber is washed, dried and pressed in the usual manner to form the

hard sheet known as vulcanized fiber.

In the above-recited process, the concentration of the zinc chloride solution, the temperature of the bath and the time of the treatment must be carefully controlled to prevent the formation of a dark, brittle fiber.

The use of concentrated calcium thiocyanate solutions has been proposed in U. S. Patents Nos. 1,301,652 and 1,333,465, to Clayton et al., who discovered that the solvent properties of such solutions with respect to cellulose could be utilized to gelatinize cellulose. According to the patented process, cellulosic material, such as cotton rag paper, is treated with calcium thiocyanate solutions of such concentration as to boil at 157° C., and preferably having an acid reaction. The paper is treated with such solution at a temperature of 130° C. for about 30 seconds and is thereafter washed and dried in the usual manner.

The solutions proposed in the above recited patents are very concentrated, being, in fact, so concentrated that they are very viscous, even at 130° C., and solidify at atmospheric temperatures, especially in acid condition.

Hot Solutions Used

According to my invention, cotton rag pulp paper, paper made from chemical wood pulp, or the like is heated with a neutral or alkaline solution of calcium thiocyanate or other thiocyanates of such concentration as to have a boiling point of from about 130° to about 140° C., and preferably containing comparatively large amounts, for example, from about 15% to about 30% of formaldehyde.

The treatment is carried out at substantially atmospheric temperatures, for example, from about 20° to 40° C. The fiber is not allowed to remain in the treating bath until gelatinization is complete, but removed the fiber from the bath after a short time and allow the treated fiber to lie flat for a sufficient interval to insure that gelatinization is carried to a satisfactory degree.

It will be obvious that the actual treatment of the fiber will be subject to many modifications, such as time of treatment, concentration of solution, nature and state of cellulosic materials used, pressure and the like, according to the nature of the materials treated or the character of the results desired.

Formaldehyde Used

Cotton rag or wood pulp paper is run through a bath containing 3 parts of an 80% solution of calcium thiocyanate and one part of formaldehyde. The reaction of the solution is preferably neutral or slightly alkaline and the temperature of the solution is maintained at any convenient point within the approximate range of from 20° to 40° C. Higher temperatures are to be avoided. The paper is run through the bath at any speed that permits thorough wetting without retaining the paper in the bath for extended intervals. It is then wound, as in prior practice, upon a large drum, except that the drum is not heated. After a sufficient number of layers of the paper have been wound upon the drum to produce a sheet of desired thickness, it is removed, cut to desired size and allowed to lie flat for from 30 minutes to sev-

eral hours in order to permit gelatinization to take place. It is then pressed, either with or without heat, washed, preferably by the counter-current system, dried and again pressed to form a flat sheet of hard fiber which may be drilled, machined and polished, as desired.

Although a certain amount of adhesion of the built up layers or laminations of fiber may take place prior to the initial pressing operation, such pressing is desirable to insure that the layers adhere thoroughly to each other.

There are many advantages to be gained by treating cellulose according to my invention. It requires no high temperatures, the use of which is always attended with considerable cost. Hot solutions of calcium thiocyanate are much more corrosive, especially in acid condition, than the cold, less concentrated and neutral or alkaline solutions which are preferable. Cold solutions of calcium thiocyanate give rise to less occupational hazards than hot solutions. Moreover, the presence of formaldehyde in my preferred solution reduces its corrosive action.

A solution of calcium thiocyanate having a boiling point of 157°, is very viscous, and, although applied to the paper at 130° C., cools quickly on the surface of the paper, becoming more viscous, or even crystalline, and rendering its removal from the forming rolls difficult. Much excess material is thus carried to the washing vats.

It was found that neutral or alkaline solutions of calcium thiocyanate crystallize much less readily than acid solutions. Furthermore, the solutions of calcium thiocyanate which it is preferred to use, with a boiling point of about 134° C., although viscous, show no tendency to crystallize at ordinary temperatures, and the addition of formaldehyde reduces the viscosity of such solution and actually increases the gelatinizing action.

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Plastics Abroad

(Continued from page 22)

La Ronite, in Rosny-sous-Bois, (Ronite), The latter one operating under Eichengruen patents for molding powders.

Germany's creator of the cellulose acetate plastics was Dr. Eichengruen and the three companies which benefitted mostly thereby were the I. G. (Cellit), the Rheinisch Westfälische Sprengstoffwerke in Troisdorf (Cellon and Trolit) and the Cellon Werke Dr. Eichengruen (Cellon); Another producer is the Deutsche Lonaritwerke (Lonarit).

A great impetus to the use of cellulose acetate plastics is die casting or the extrusion process which developed in Germany and which permits the smaller molders to go into large-scale production at a low investment cost. This extrusion molding process uses acetate powders which are softened in the machine by heating and then forced by high pressure through a narrow nozzle into the cold mold. This procedure allows a rapid operation, at little cost for molds and equipment, and yields a high hourly output rate. As a mark of the great success of this process, it may be stated that nearly the entire German electrical industry has installed machinery of this type for mass production. The A. E. G., Siemens-Halske, Siemens-Schuckert, Mix & Genest, Neufeld & Kuhnke and others are among the biggest producers. One of the most important radio tube manufacturers, Philips in Holland, uses the cellulose acetate extrusion process for tube bases. The estimated consumption of the United States for 1929 was 200,000,000 tubes with phenolplastic sockets, and if we figure, that similar quantities were used in Europe we can readily compute the amount of cellulose acetate consumed. France is starting to use Ronite for extrusion-molded cellulose acetate plastics. Japan and China are getting active too.

As indicated above, there are still many problems in this field of cellulose miracles. New plasticizers for cellulose acetate frequently appear on the market, but none of these has proven to be what camphor is for pyroxylin. Phosphoric acid esters are used to reduce the burning rate to a point where the material is practically non-burning. The sulfonamides still play an important role.

Cellulose Ethers

Before we close, we will devote a few words to other cellulose derivatives. The methyl ether, still in a laboratory state is being tried in the textile industry (Coloresin). The ethyl ether seems to show some advantages in lacquers where solvents like toluene are required, but the price is still disproportionately high. The same is true of benzyl cellulose. Germany and France show an increased activity along this line and it will be highly interesting to watch the results.

This rather incomplete survey is not intended to picture the full scope of affairs in the European plastics picture. It is merely intended to indicate here the important lines of established manufacturing activity, of processes which really have grown past the stage of semi-commercial units. It will be seen in the near future whether this activity is to be maintained; whether the ever-increasing number of small companies will be able to endure and overcome the present depression and whether the constantly changing demand, arising from changes in the conditions of living, will force the plastics industry into a broader program of research and development or cause a slowing down to a more conservative attitude.

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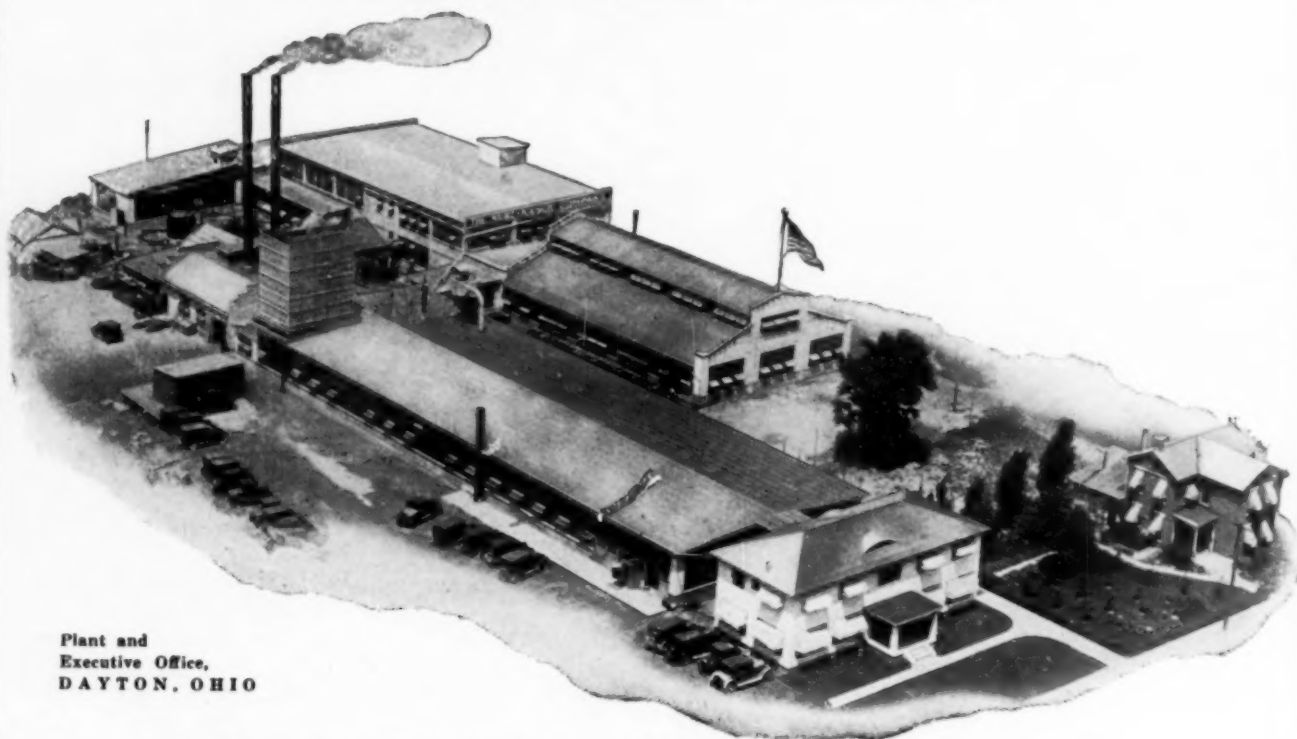
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Anhydrous Resinifying Reactions

By using resorcinol and paraformaldehyde, without catalysts, Novotny produces directly a strong thermoplastic resin

AN interesting modification on the time-honored phenol-formaldehyde resins, is one made from di-hydroxyphenol, i.e. resorcinol. Its properties are quite different from the older types of phenolic resins; another example of the fact that so-called "obvious equivalents are not always so in fact.

Emil E. Novotny has contributed this one, thus adding another invention to his imposing list of resin patents. As described in his U. S. P. 1,767,696 (filed Aug. 14, 1926; issued June 24, 1930).

Fusible Products

This invention relates to the production of synthetic resins or plastics wherein resorcin, a phenolic body, is combined with a dry and substantially anhydrous active methylene body such as paraformaldehyde or other dehydration products, polymers and other derivatives of aqueous formaldehyde. The resorcin is mixed with a quantity of say paraformaldehyde whereby an insufficient amount of an aldehyde body or equivalent is combined with the resorcin in order to moderate the reaction and produce fusible and preferably soluble resinous products with unfailing uniformity. It is preferable to use the paraformaldehyde in an amount not to exceed one half of its molecular ratio to the resorcin. Resinous products of great strength, high dielectric qualities and rapid reaction are thus obtained preferably without the use of catalytic and condensing agents.

Where resorcin is combined with paraformaldehyde with or without a catalytic agent great

A resinifying reaction that is so simple that it can be carried out in an open glass beaker, is the theme of this process.

precautions are necessary where the proportion of the aldehyde to the resorcin is approximately equamolecular. It is of course of great advantage to be able to produce a resinous reaction which is preferably fusible and soluble and which may, therefore, be used as a varnish or lacquer for the impregnating and coating of suitable substances. It is likewise advantageous to produce grindable resinous reaction products wherein the resorcin and the active methylene body have been thoroughly and uniformly combined and produce thereby resins of low melting point and good solubility in order that these resinous products may be thoroughly mixed and comminuted with various fillers without materially decreasing the fusibility and solubility of these resins when so mixed.

If the reaction between the resorcin and paraformaldehyde were to be carried out on the basis of equamolecular proportions an exothermic reaction sets in at temperatures lower than 176° F. the reaction proceeds in a portion of the product only, starting usually from the top of the mass and ends in an infusible and insoluble product before the entire mass has been liquefied or for that matter has been formed into a resinous product. As the resorcin is relatively expensive it is necessary that the reaction proceed uniformly throughout the entire

mass whereby a large yield of fusible preferably soluble resinous product may be obtained.

The resorcin paraformaldehyde resin has a tensile strength again as high as a resin made of phenol and formaldehyde, it requires no catalytic or condensing agents and there is no appreciable water of condensation formed or liberated. The resin is moreover less thermoplastic and, therefore, is valuable where the finished product must withstand high temperatures. The material shows less carbonization under an arcing test than to the resinous products made with phenol, and it shows less inflammability. These valuable characteristics together with the fact that the product reacts rapidly into a strong hard and set resin makes the material useful for valve packing, etc., under high steam pressures, for a binder in the manufacture of molded commutators, as a coating or reinforcing agent for electrical insulation, etc.

Controlling the Reaction

With these desirable attributes, however, it is important that the reaction should be controlled to the point where substantially all of the resorcin is combined uniformly with substantially all of the active methylene body in such a manner and by so regulating the proportions that the reaction will not become too energetic to be controllable. This is readily accomplished where an amount of active methylene body such as for example paraformaldehyde is combined under conditions where the pro-

portion of the paraformaldehyde for example is preferably somewhat less than 54 parts of paraformaldehyde by weight to 100 parts of resorcin or in other words one half mol. of paraformaldehyde to one mol. of resorcin. Even with this reduced amount of aldehyde, however, the reaction is quite energetic and it is preferable, therefore, to use somewhat less paraformaldehyde and it will be found that where the ratio of the paraformaldehyde is on the basis of $\frac{1}{4}$ mol. paraform to one mol. resorcin a fusible soluble resin has been produced which may be heated for a long time up to a temperature not to exceed 300° F. without becoming infusible and insoluble.

No Catalyst Needed

The reaction is preferably carried on without a catalyst and at ordinary atmospheric pressure, and the resin may be made in a pyrex beaker without refluxing as there is no appreciable amount of loss in reagents and apparently there is no separation of water nor has it been possible to detect so far the presence of any synthetic water. Where dry paraformaldehyde is used the reaction can be carried out on a large scale in any suitable open vessel provisions being made for heating and cooling the same within the limits to be given in the examples to follow:

From a physiological standpoint it is preferable to provide a suitable enclosed digester provided with a condenser which may be used for either refluxing or distillation and preferably provided with suitable stirring devices, inlets and outlets for the raw materials, and a jacket for heating and cooling the contents. The reaction between resorcin and paraform is an extremely violent one even though no catalytic agent is present as might be mentioned from the facts gathered from an experimental reaction wherein the paraform was in the ratio of $\frac{1}{2}$ mol. to 1 mol. of resorcin. Upon heating these products in

a pyrex beaker suspended in a water bath, under precautions so that no super heating takes place, the temperature slowly rises to approximately 176° F. where upon there is a rapid rise to about 220° F. while the product is still in the water bath, the water bath having a temperature of 212° F. Under these conditions a vigorous reaction takes place turning the entire mass infusible.

This rapid exothermic reaction explains the great speed with which the final molded infusible product may be produced in suitable dies and therefore, where complicated dies are used it is often advantageous to use a molding plastic more quickly reactive even though the raw material cost be higher.

Particularly Suitable For Electrical Work

The larger per diem production together with the elimination of extraneous substances such as the catalyst make the product an extremely valuable one for electrical purposes. By the proper balance of the proportion of preferably paraform to the resorcin it is possible to obtain practically any reaction speed desired, and this at temperatures considerably lower than where phenol is used instead of the resorcin.

It is desirable at times to add to either permanently fusible resin made with less than $\frac{1}{4}$ mol. of paraform or to the potentially reactive resin made with less than the $\frac{1}{2}$ mol. of paraform an additional amount of paraform or other polymers or other dry active methylene bodies as further combining accelerating or hardening agents. This may be added to the resinous product in various proportions as the requirements of the case would warrant up to an amount which would bring the actual paraform ratio to an equamolecular basis. There is, however, no objection to using the paraform somewhat in excess of this amount. The additional paraform or other active methylene body combines with

the previously formed resinous body less energetically at temperatures below 212° F. and as there is no elimination of water in this reaction, highly polished smooth molded parts can be made which leave the mold in a finely polished condition.

The cleaning qualities of the resorcin paraform resin are so marked that the product may be used as a cleaning agent for molds which have become tarnished or stained when other materials had been cast in them. The use of this material will often obviate the necessity for frequent cleaning and polishing of discolored molds.

While it has been found that hydroquinone is not quite as rapid in its reaction as resorcin it is to be considered as a suitable equivalent for the same. While hexamethylenetetramin is not as rapid in its reaction as paraform and while it is objectionable because of the free ammonia liberated it is considered useful for this purpose.

Specific Example

Example 1

Resorcin	55
Paraformaldehyde (38% of molecular weight of resorcin)	12

Proportions given by weight.

Place materials into a suitable vessel such as an ordinary open pyrex beaker and heat beaker and contents over a water bath to a temperature of 230° F. where a reaction occurs of a rather energetic nature. At this temperature a fusible, soluble resin is obtained and heating may be continued until a product of the desired viscosity has been obtained. The longer the product is heated the harder the resin becomes and thus a grindable product can readily be obtained. Although the contents of the beaker are heated over a water bath the temperature rises rapidly to 230° F. and unless the product is cooled the temperature will rise up to 280° F. in a few minutes. This fusible, soluble resin is potentially reactive and will upon heating to say 300° F. or higher go rapidly to its hard set and

infusible state. The fusible product produces a very light colored varnish or resin. The intermediate material is soluble in various organic solvents such as alcohol, acetone, furfural, furfuralcohol, etc.

Example 2

This example shows the use of a reduced amount of paraformaldehyde of an amount equivalent to $\frac{1}{4}$ mol. of paraformaldehyde to 1 mol. of resorcin.

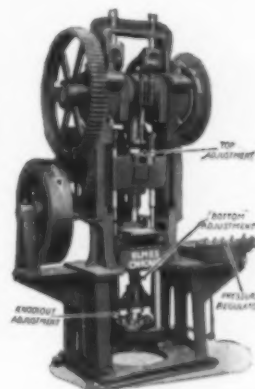
	Parts by Weight
Resorcin	55
Paraformaldehyde	8

Heat above in the manner described previously, the temperature rises slowly to 300° F. forming a fusible, soluble resin. If the product is heated for sometime at the temperature of say 300° F. a grindable but fusible, soluble resin results. The product is of the nature of a more or less permanently fusible resin and requires the addition of a suitable hardening agent in order to be converted finally to its hard, set and infusible form. For the hardening agent it is preferable to add an additional amount of paraformaldehyde in an amount equal to at least $\frac{1}{2}$ mol. of paraformaldehyde to 1 mol. of resorcin calculated on the basis of the resin contents of paraformaldehyde and resorcin plus the additional paraformaldehyde added. The paraformaldehyde may be increased until there is an amount added to make the paraformaldehyde on an equamolecular ratio with the resorcin. There is no objection to a slight excess of paraformaldehyde although no real advantage accrues therefrom. The paraformaldehyde reacts rapidly with the resinous product described in this example but the reactivity is so controlled that the material may be mixed or handled without difficulty and the product will keep in this potentially reactive form for an indefinite period of time at ordinary room temperatures.

Automatic Tablet Machine

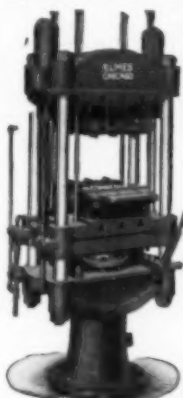
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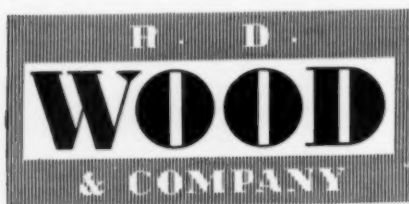
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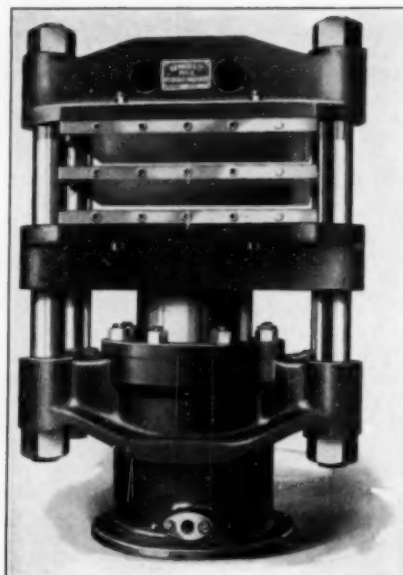
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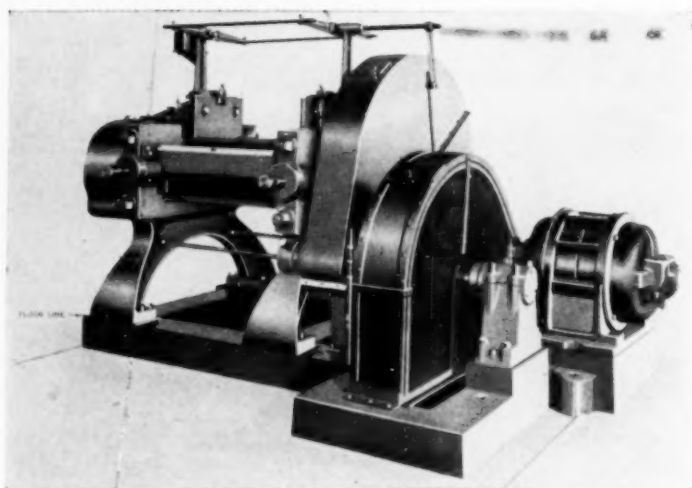
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Suitable lubricants, modifiers and plasticizing agents of a liquid, semi-solid or solid nature may be added, likewise various coloring materials such as dyes and pigments, and these products may be added to the resinous material either before, during or after the reaction. They may likewise be added to the varnish product, the dyes preferably in solution and the pigments in colloidal suspension.

It is of interest to know that a quantity of resorcin and paraformaldehyde wherein the paraformaldehyde was in the ratio of $\frac{1}{2}$ mol. to 1 mol. of resorcin was placed in a pyrex beaker and heated in an alcohol bath. While the contents were being heated in the alcohol bath the temperature slowly rose in about 20 minutes to 210° F. when the mass slowly reacted to infusibility but there was no violence, perhaps, due to the cooling action of the boiling alcohol.



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Metduro In Serious Position

A remarkable position is revealed in an interim report issued by Metduro, Ltd., the company formed in Britain two years ago to produce new plastic products. Since the annual meeting in April last, the firm's board has been completely changed. The new directorate, in which Sir H. Cassie Holden has succeeded Mr. Blum as managing director, states that the company's only tangible assets of any reliable value are the factory at Waltham Abbey, estimated to be worth £55,000 (\$275,000), "but unsaleable at present," plant, machinery, fittings, furniture, estimated at £10,000 (\$50,000), and unpaid instalments on the Preference capital.

In addition the company owns all the shares in the German Papyroplast Co., which in turn owns the German and British rights of the process. Apart from the Herold A. G. rights, all the remaining assets appearing in the balance-sheet have proved of little or no value. In the last balance-sheet assets totaled £584,000 (\$2,920,000).

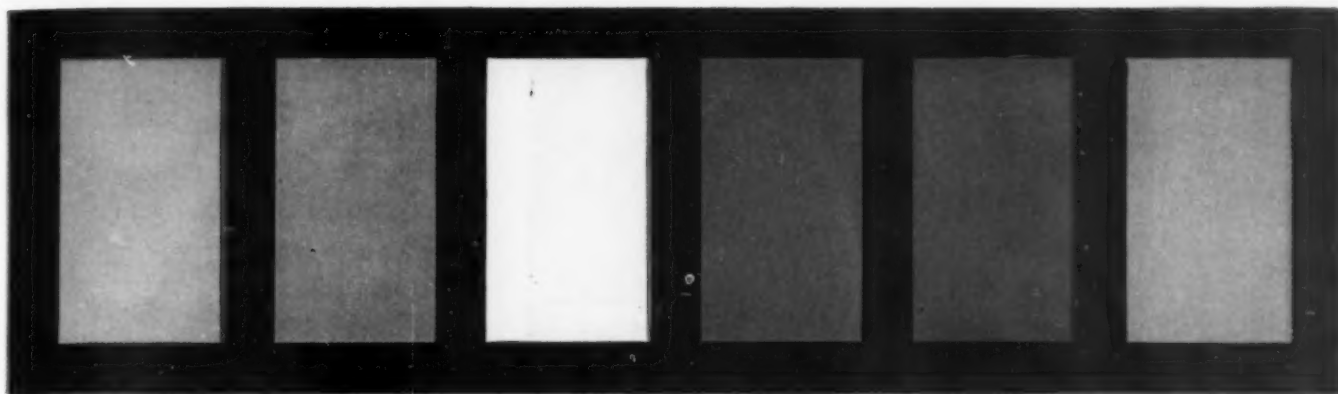
The Metropole Development Co., which secured large intermediate profits on the sale to Metduro of freehold property and rights in Papyroplast, invested a considerable part of the profit in the company's shares. A revision of these transactions is under consideration.

Since the company has now only a small amount in cash and further money is required for plant ordered from German and other firms in respect of the first Herold unit, now in course of construction, it is proposed to call up 2s. 6d. (60 cents) per share on the Preference capital which will meet immediate liabilities.

A Decade of Molding

(Continued from page 12)

be exploited. An increased use of molded housings has recently been apparent. This is a field which I believe will grow very



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And, for most of these purposes, the standard Durez colors have proved highly satisfactory. Twenty-two beautiful solid shades, and a wide range of mottled and striated effects give

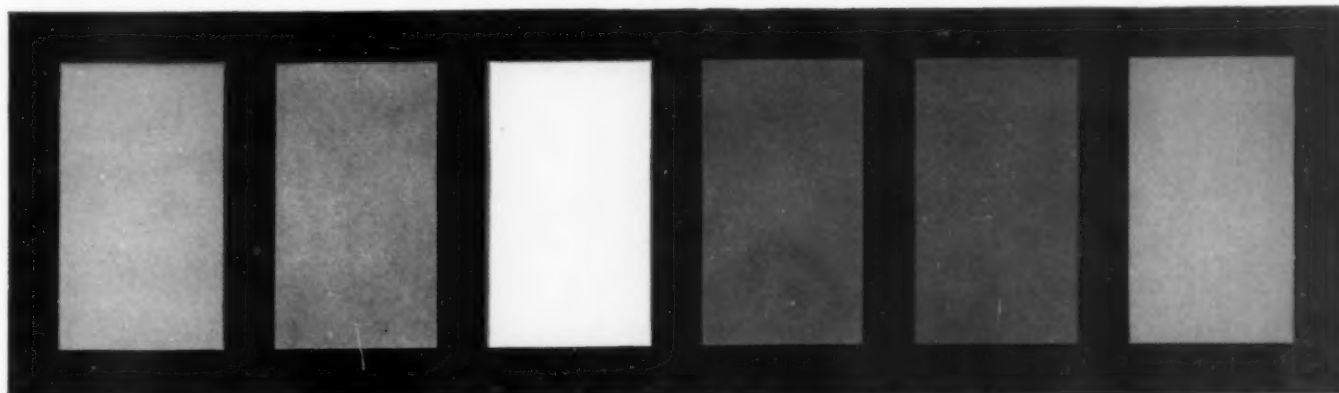
the manufacturer an exceptionally large field to choose from. But for many special purposes, especially where competition is keen, colors even more exquisite than those in the standard range are essential! To meet that condition, Durez has perfected these exclusive pastel shades.

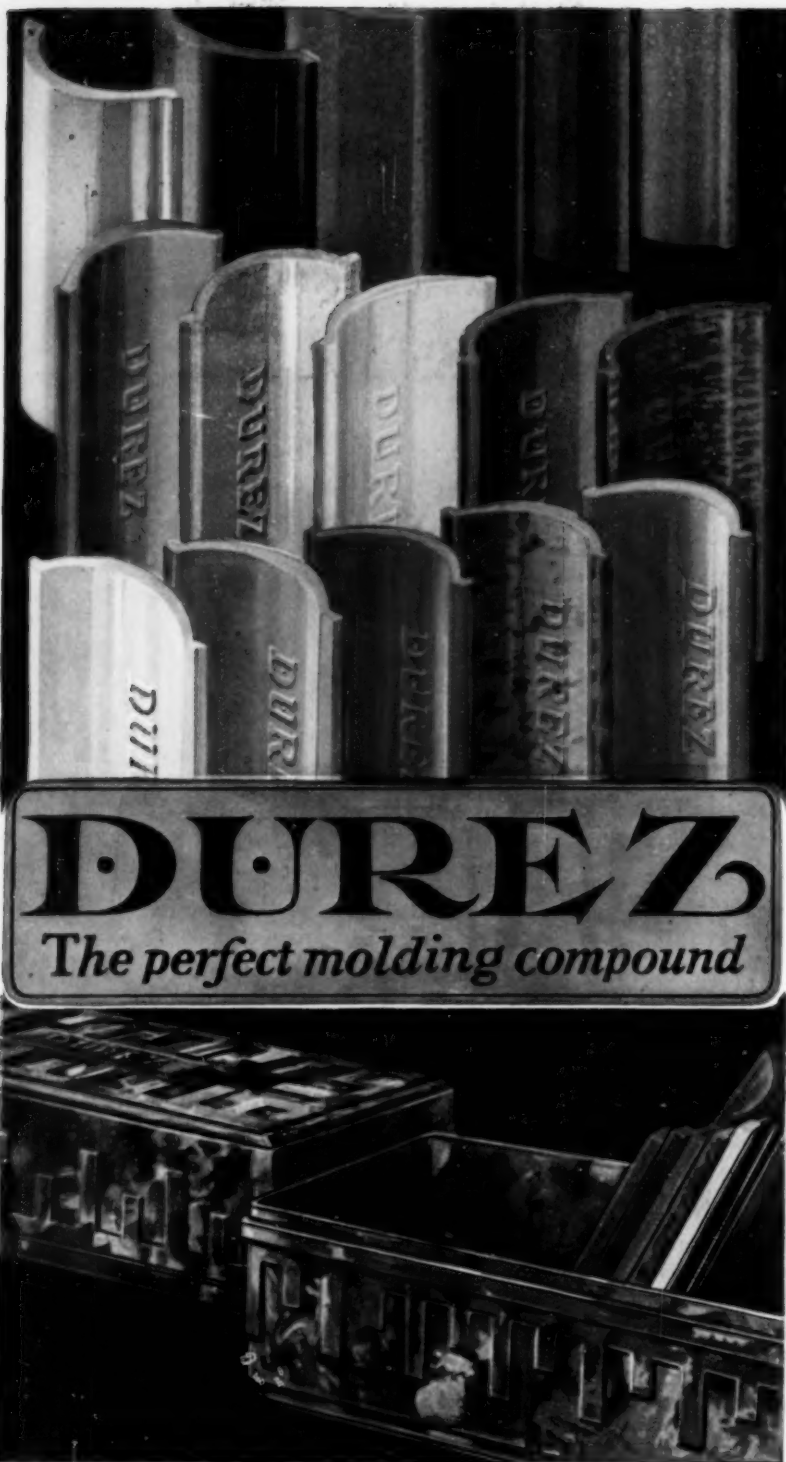
Features of the new pastel colors

For the time being, Durez pastel colors will be available in old ivory, light blue, gray, pink, green, and yellow. Other colors will follow as demand warrants, and as further research brings to light practical and economical methods of manufacture. The six colors are fresh and soft, harmonize in the proper setting without clashing, and are less subject to fading than many of the deeper shades now on the market.

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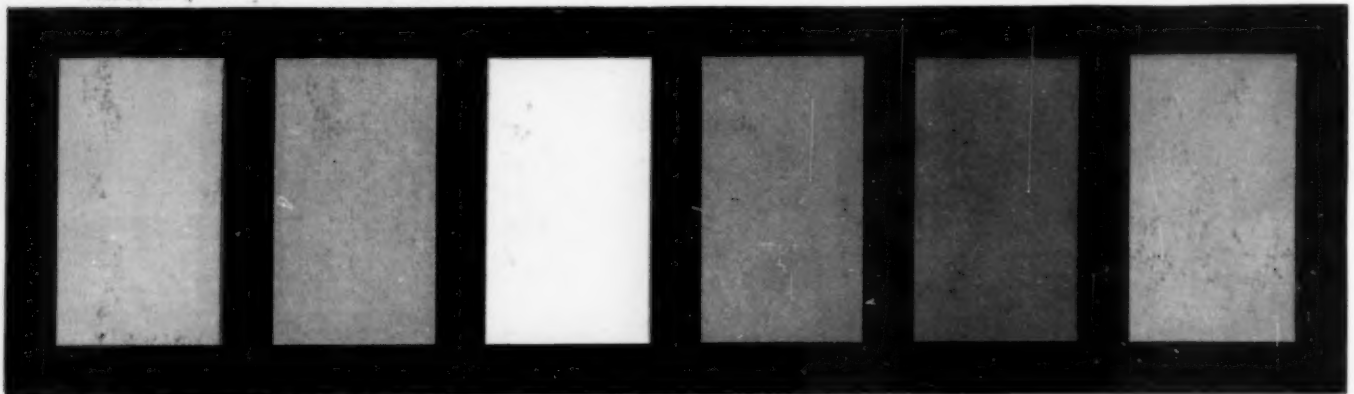
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Never before have manufacturers in every type of business devoted greater study to the improvement of their products. Durez pastels will greatly increase the attractiveness of many of these products, through their new appealing neutrality - tints that do not clash with colorful surroundings but form a harmonizing part of the complete color scheme. Yet these pastels are distinctly individual, and may be used to form satisfactory complete pieces.

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The illustration shows a set of color samples, and one of the many delightful color applications, carried by Durez molders and Durez representatives. At a word from you, we will be glad to have them call and explain the color possibilities of Durez.



rapidly. We have only recently become aware of the decorative possibilities of phenolic and urea molded plastics. With these we can produce permanent, non-tarnishing, decorative surfaces in a wide variety of colors and effects. These surfaces are an integral part of the molded piece. But molded housings serve not only decorative and protective purposes. They also serve as mountings for what-



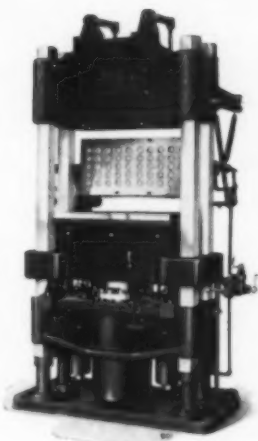
Photo courtesy General Plastics, Inc.

Molded fountain seats were unheard of in 1920. Now they are quite the last word in bright-colored synthetic resinoid.

ever instrument or mechanism they may contain. In fact, the molded housing may even incorporate part of the mechanism.

The molder may look to the future with every assurance that his industry will continue to grow. Materials at present available are being continually improved and new materials are constantly being offered which increase the versatility of molded goods. Abundant sources of raw materials are now available for the manufacture of plastic compositions, ensuring an adequate supply at low cost to the molder.

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Some New Casein Processes

(Continued from page 26)

or below this proportion, according to the degree of plasticity desired for moulding.

The ethanol-amines, either singly or in the mixture may likewise be included in the proportion of about 5%, which proportion is also subject to variation according to the amount of plasticity desired. The various substances may then be incorporated together in any convenient way, as by kneading in an appropriate kneading machine or by other stirring or working devices, until a homogeneous mixture is obtained. The mixture may then be moulded in the usual way.

After removal of the moulded objects from the molds they may be set aside to dry by evaporation of the contained water. This evaporation occurs at a good rate of speed but even when the object has lost practically all of the included moisture, it does not lose its plasticity entirely because of the presence of the non-volatile ethanol-amines. Accordingly, the moulded object shows no tendency to crack or check, and it retains a substantial amount of plasticity throughout its life instead of assuming the extremely hard, brittle condition characteristic of casein objects as previously moulded.

A Dry Modification of the Process

The ethanol amines likewise show a substantial amount of hygroscopicity. Accordingly the casein object does not dry down to the degree of dryness which occurs in the absence of such substances as the ethanol amines previously disclosed.

Alternatively the water of the previously described embodiment may be omitted. For this embodiment, the dry casein, and the appropriate ethanol amines may be mixed, and kneaded together for a suitable

length of time by any convenient means, until a homogeneous mixture is obtained. This mixture is less plastic, with the same portion of amines, than the mixture containing water, but an adequate amount of plasticity is obtainable by the use of increased quantities of the amines. The mixture may then be moulded in the usual way, by the application of suitable pressure as in a mould or otherwise. The amount of plasticity obtained by this embodiment is less, but substantially constant, over a considerable period of time, as compared to the previously described embodiment.

Avoids Soaking Step in Hardening Casein

THE immersion of shaped or molded casein articles in formaldehyde solution in order to harden them is avoided by a process described by Julius Schinck and Georg Münchmeyer, of Hamburg, Germany, where they filed a patent application five years ago. Their corresponding United States Patent, 1,753,626, did not issue, however, until April 8, 1930.

Albuminous substances such as casein, blood substances and proteins are converted as is generally known into horn-like products by subjecting the moistened kneaded and moulded mass to the action of aqueous formaldehyde solutions. This process which is known in the industry as the hardening process has however the disadvantage that even in the case of moulded articles of small thickness, such as 2 centimetres for example, a reaction time of some months is necessary. It has therefore been suggested, as is known from literature on the subject, that the hardening of the pulverulent albuminous substances should be effected with formaldehyde before the

kneading or moulding takes place, or that during the kneading, hardening media, such for example as formaldehyde, tannin and the like should be added. These suggestions have not resulted in any practical success. Albuminous substances hardened in advance are no longer sufficiently plastic to enable suitable horn-like products to be made therefrom, while the hardening media suggested as an addition to the mass, such as formaldehyde and paraformaldehyde either act too quickly upon the albuminous substances during the kneading process and thereby hinder the kneading, or else like hexamethylene tetramine, do not harden the product sufficiently.

Paraformaldehyde Used

The present invention starts from the idea of adding to the albuminous substances, and more particularly to casein, before or during the kneading, a hardening medium, which only develops its main action after the kneading and moulding actions have terminated and thus does not hinder these processes. It has been discovered that from paraformaldehyde which in itself acts upon albuminous substances very similarly to formaldehyde, by treating it with acids, such for example, as sulphuric acid or formic acid a hardening medium of the kind desired can be obtained. The paraformaldehyde, by the treatment with acid, is in a sense protected from premature decomposition and the giving up of formaldehyde to the albuminous substances, so that it only exerts its hardening action when the kneading and moulding of the albuminous substances have terminated. Its action is promoted and completed by the usual drying of the moulded plastic material.

This process constitutes an important technical advance because it very greatly shortens the time required for the manufacture of horn-like products

from albuminous substances. The material obtained admits of being worked in the same manner as the artificial horn-like products already in use.

Examples:

(1) 200 grams of paraformaldehyde are dissolved in 300 grams of sulphuric acid of 35 to 40 per cent by weight by heating to 95° C. and separated out again by cooling. The product separated out is washed free of acid with water that is as cold as possible and is mixed in an aqueous emulsion which is as finely divided as possible with 10 kilograms of slightly moistened casein. The material is then worked in the manner usual in the artificial horn industry, with rollers for

example, and pressed under high pressure. The product so obtained is dried.

(2) 10 kilograms of moistened casein are mixed with 150 grams of finely ground paraformaldehyde which has been soaked in 400 grams of a 30 per cent formic acid solution, kneaded by rolling and pressed. The product is then dried.

There is a decided trend to group products. Manufacturers of fountain pens look for items reaching the same markets. They package pencils, pen holders, erasers, etc., in one carton—a writing set.

Coty did this when they introduced their Manicure Tray Set.

The Durez Molder

Aldehyde Resins

(Continued from page 16)

a 10% sodium solution. The reaction corresponds to that referred to in Example No. 1. After some time, solid resinous compounds are obtained.

Example 5

500 parts of acetaldehyde are introduced, while stirring and cooling, into 500 parts of a 5% solution of sulphide of sodium. The process is similar to that referred to in Example No. 1 in which a sodium solution is employed and solid resinous substances are obtained.

The products obtained in accordance with our invention are solid masses at ordinary tem-

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perature; their melting point lying above 50° C. According to duration and manner of treatment, they range from transparent to nearly opaque, and from a light yellow to a dark reddish brown. They possess a vivid gloss and their degree of hardness increases with the duration and intensity of the treatment with alkaline acting means. Their melting point increases in the same measure, it eventually resting at between 100° to 200° C., and it may even reach 300° C. They are soluble in organic solvents, such as alcohol, acetone, anhy-

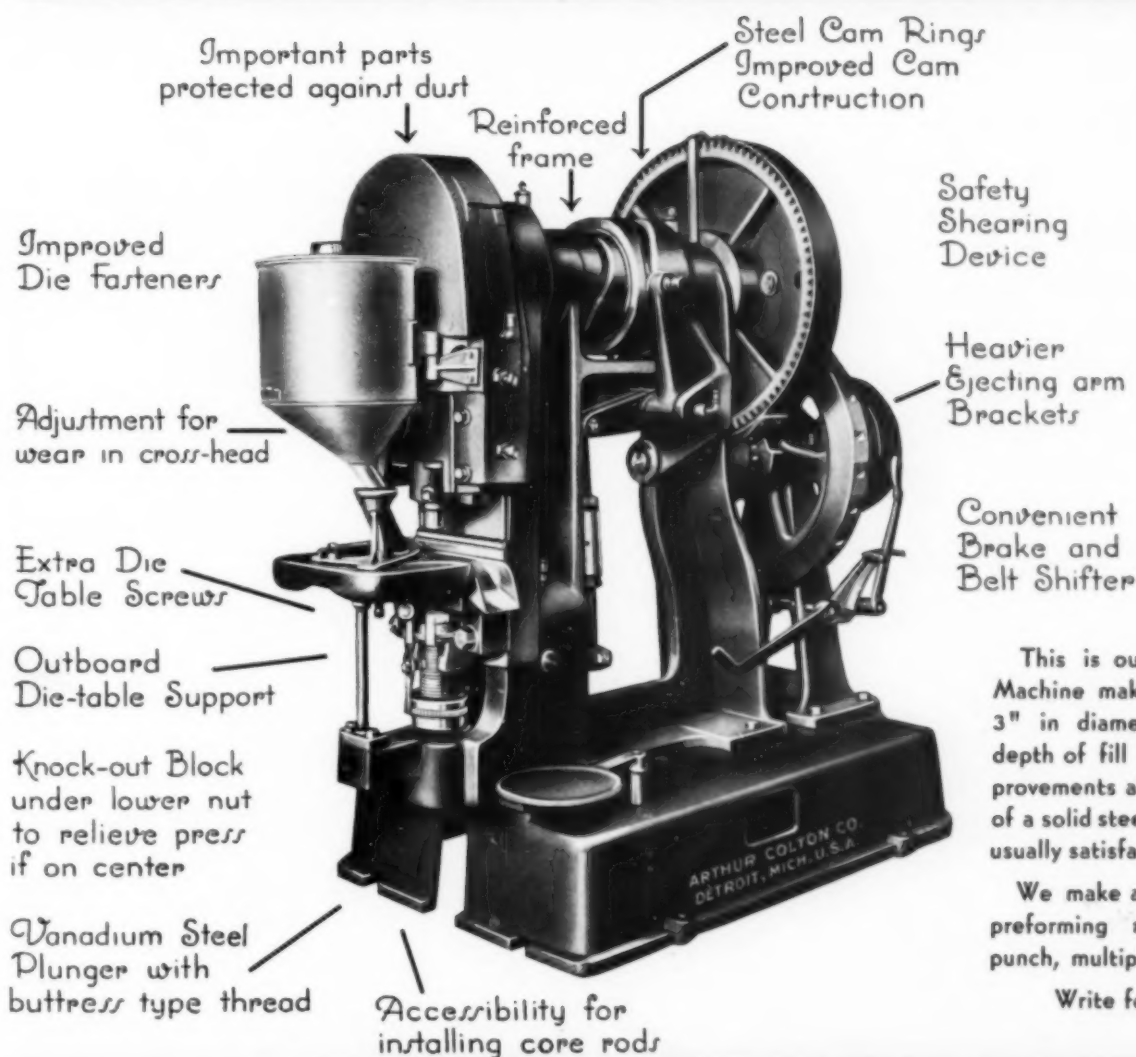
drous acetic acid, linseed oil, turpentine oil and others. Such solutions may be employed for varnishing and polishing purposes, more especially for treating, for example, wooden, metallic and plaster of Paris surfaces. They are especially useful for first-coating and further for the impregnation of wood, card board, textiles and other porous fabrics.

All these solid resinous condensation products may be transformed into shaped solid and workable articles under the application of pressure and preferably under higher tempera-

tures, all with or without filling or charging agents, such as sawdust, asbestos, and the like.

Upon treating these solid amorphous bodies with mineral acids, preferably after the preparatory solution of the resin-products in organic solvents, such as anhydrous acetic acid, yellow substances are obtained by the precipitation with water, which will not fuse until raised to above 300° C. and which are very capable of resisting temperature influences. They may be employed in a manner similar to the bodies above referred to.

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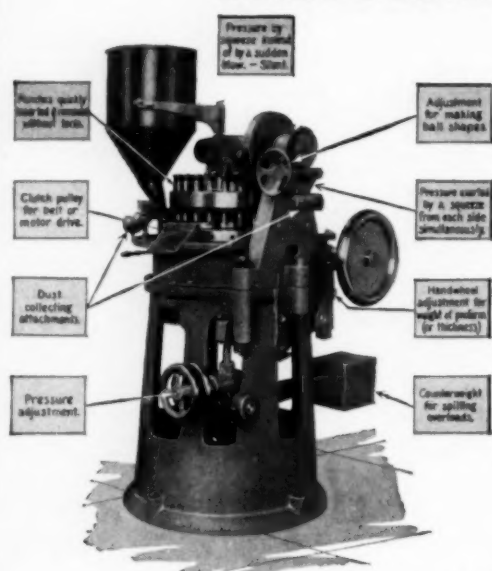
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Synthetic Plastics in the Art of Printing

How inventors have availed themselves of the valuable properties of the synthetic resins in producing printing plates, type and matrices

By Charles W. Rivise

This review, continuing from p. 665 of the November issue, completes the description of E. E. Novotny's U. S. P. 1,401,633

Claims cover plate and matrix having fibrous body portion impregnated with hand having printing face of acetaldehyde condensation product.

E. E. Novotny, 1,410,031, March 21, 1922. Filed July 13, 1921.

Method of Making Printing Plate Matrices

Patentee incidentally states that the described and claimed metallic matrix may be used for molding plates made of synthetic resins.

E. E. Novotny, 1,442,173, Jan. 16, 1923. Filed January 21, 1921.

Blank formed by impregnating a fibrous base such as strawboard with fusible phenolic condensation product and heated to infusibility, or molded from well-mixed mixture of fiber pulp and dry, pulverized infusible condensation product is coated on one or both sides with phenolic varnish, sprinkled on one or both sides with pulverized infusible condensation product and molded against face of matrix which has been sprinkled in the same manner. The matrix may have been made in the same manner as the printing plate. Instead of using blank made as above, pulverized condensation product may be applied to matrix and plate made therefrom by pressure and heat.

The condensation product may be composed of phenol and formaldehyde, acetaldehyde or furfural, each composition mix-

Commencing on page 324 of the June issue, we have brought to our readers a number of portions of this rather unusual extract from the archives of the United States patents, selected so as to bring out the uses to which synthetic resins have been applied to the printing art.

Only those who have attempted to search the literature and patents in this widely scattered art can appreciate the difficulties in locating this material. By publishing the results of these searches, we are saving some of our readers not only many hours of toil, but the cost of a trip to Washington.

ed with a suitable catalyst such as ammonia or hydrochloric acid and a suitable hardening agent such as hexamethylenetetramine or furfuramide.

L. Lilienfeld, 1,505,043, Aug. 12, 1924. Filed June 10, 1922.

Cellulose Ether and Method of Making Same

An alkyl ether of cellulosic body is made by treatment of an alkyl derivative of a cellulosic body either alone or in the form of reaction mixtures which contain such alkyl ether with caustic alkali and an alkylating agent in the presence of a quantity of caustic alkali amounting to between one-fourth and one-tenth of the water present.

The product may be combined with gums, resins or phenol-aldehyde resinoids and made in-

to printing agents and compositions or thickening agents for the same.

C. Ellis, 1,514,508, Nov. 4, 1924. Filed May 9, 1922.

Ketone-Aldehyde Resin and Method of Making Same

Invention is directed to condensing a ketone such as acetone and an aldehyde such as formaldehyde using a catalyst such as sodium carbonate in the initial stage and caustic alkali in the final stage. It is incidentally stated that synthetic resins such as those made from phenol and formaldehyde, acetylene and phenol resin, urea and formaldehyde may be incorporated as well as fluxes such as camphor, tricresyl phosphate or aniline and fillers such as fibrous asbestos, powdered asbestos, linters, flock or wood flour.

Product may be made into ink wells.

A. L. Clapp, 1,566,309, Dec. 22, 1925. Filed July 19, 1921.

Fiber Boards and Method of Making Same

Cellulose such as sulphate pulp or Kraft paper is beaten out in presence of waste animal matter from tanneries to form fiber board which may be coated with a phenolplastic and a coloring agent in alcohol and molded into printing plates.

C. Ellis, 1,570,584, Jan. 19, 1926. 1926.

Cumaron Resin Composition and Method of Making Same

An ingredient of printer's ink is made by treating impure cumaron resin containing acid bodies (sulphonic) with a basic



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neutralizing agent such as soda, lime, magnesia or zinc oxide in the absence of sufficient water to dissolve the basic material and heat.

T. S. Huxhaum, 1,571,447, Feb. 2, 1926. Filed Oct. 2, 1922.

Molding Composition and Methods of Making Same

Incidentally states that molding matrices and printing plates with furfural resin is possible because interposed tin foil prevents sticking to mold.

M. C. Beebe, A. Murray and H. V. Herlinger, 1,587,269, June 1, 1926. Filed Nov. 18, 1922.

Photograph Media and Method of Making Same

This patent disclosing photolithographic, half-tone and intaglio printing plates is thoroughly discussed in *Plastics*, June, 1929 issue, page 319.

J. Scheiber & W. Noack, 1,660,094, Feb. 21, 1928. Filed April 15, 1926.

Method of Making Shellac Substitute

A shellac substitute said to be suitable for the preparation of inks is made by combining mixtures of the products of the moderate oxidation of mixtures of unsaturated aliphatic fatty acids (linseed oil acids, lactic acid, castor oil acids, etc.) and the products of the moderate oxidation of resinol acids from copals or rosin with each other by subjecting the mixture to the action of heat in the presence of condensing agents.

H. Swan, 1,667,447. April 24, 1928.

Matrix Blank & Method of Making Same

A potentially reactive resinoid composition is formed into a sheet; the sheet is sprayed with a layer of metal such as lead by means of a Schoop gun; the sheet is pressed against a positive of any desired sort as an electrotpe, photo-engraving, type set-up, etching, half tone, etc. with the metallized surface in contact therewith and subjected to heat and pressure whereby the sheet receives and retains a permanent impression of the positive in its metallized surface.

Technical Abstract Section

A Concise Review of Patents and Literature

Formaldehyde-Primary Amine Condensation Products. Will Hildebrand, The firm: I. G. Farbenindustrie Aktiengesellschaft, Germany. U. S. P. 1,777,140; Sept. 30, 1930.

Example 1

107 parts of o-toluidine are dissolved in equal parts of alcohol of 90 per cent by weight and then stirred with 100 to 120 parts of formaldehyde of 30 per cent (1 to 1.2 molecule to 1 molecule of the base) during several hours at moderately elevated temperature (30° to 80° C.). The reaction product separates as an oil which is separated from the watery alcohol. The vessel is evacuated and the temperature gradually increased to 180° C., whereby the adhering remnants of alcohol, water, o-toluidine base and indefinite crystalline by-products are removed. A molten resin remains, the output amounting to 90 per cent of the toluidine employed. After pouring out, for instance into molds, the resin solidifies to a colophony-like mass showing an amollescence-point of 60° C. The emollescence-point may be increased by employing larger quantities of formaldehyde.

Example 2

200 parts of aniline are dissolved in 320 parts of alcohol of 94 per cent, and 225 parts of formaldehyde of 30 per cent (=1.05 molecule) are added while stirring for 1 to 1½ hours, the temperature being kept below the boiling point. A resin forming a thin liquid is precipitated, the separation of which is completed by continued boiling. The product is further treated as described in Example 1. A clear, yellow resin showing a solidification-point of about 50° C. is obtained.

Cellulose-Ester Solutions. Jacob Kleinhaus Weidig, assignor to the Cellulose Utilities Corporation. U. S. P. 1,775,179; Sept. 9, 1930.

Example 1

32.0 pounds of nitrated cotton (prepared according to the usual and well-known methods for producing a pyroxylin cotton and containing for example about 12% nitrogen) is dissolved in a mixed solvent containing 102.6 pounds of denatured alcohol, 52.0 pounds of ethyl acetate and 7.6 pounds of acetone, after which 4.0 pounds of castor oil is added and thoroughly mixed in about 7/8 pounds of bicarbonate of soda is then added to the mixture which is then placed in a barrel-type mixer and "tumbled" for from 10 days to about 2 weeks. The resulting cellulose ester solution has a viscosity of about 6 seconds as determined by the "metal-ball" viscosimeter using a

steel ball of about ¼ inch diameter and weighing between about 1.035 and 1.045 grams, and allowing the ball to fall thru a 10 inch column of the cellulose ester solution contained in a glass tube about 15 inches long and about 1½ inches in diameter, the temperature being about 23° C. That is to say, the viscosity is such that it requires about 6 seconds for the steel ball as above specified to fall vertically thru the column of solution the specified distance (10 inches), the container, or cylinder, being as specified.

As compared with the cellulose ester solution made up in the usual way and containing the above ingredients in the above specified proportions but containing no sodium bicarbonate, the improved cellulose ester solution of the present example has a viscosity of only about 1/7 to 1/8 that of a corresponding cellulose ester solution prepared in the same way and having the same composition except as to the sodium bicarbonate.

12 examples in all are given.

Styrol Shatterproof Transparent Material. Ernest Hopkinson, of New York, N. Y., assignor to the Naugatuck Chemical Company, of Naugatuck, Connecticut, a corporation of Connecticut. U. S. P. 1,777,309; Oct. 7, 1930.

1. A method of manufacturing a shatterproof glass-like product which consists in plying strata of polymerized styrols of differing states of polymerization, and uniting them into an integral article.

2. A method of manufacturing a shatterproof glass-like product which consists in forming a stratum of a tough polymerized styrol, applying to the stratum a harder styrol of a higher state of polymerization, and integrally uniting the strata.

3. As a new product of shatterproof glass-like material consisting of integrally united strata of styrols polymerized to different states.

Mica—Pitch Composition. Clarence R. Eckert, assignor to the Barrett Company. U. S. P. 1,773,131; Aug. 19, 1930.

Mica is mixed with pitch to produce a toughened-pitch composition. Mica is less expensive than infusorial earth, does not cause foaming when mixed with pitch, remains in suspension without an appreciable tendency to settle out, is flaky in structure and has great tensile strength so that when admixed with pitch in imparts binding strength to the mixture and thus prevents breaking and shattering thereof at low temperatures.

Synthetic-Resin Manufacture. Emil E. Novotny, assignor to John Stogdell Stokes, of Spring Valley Farms, Huntingdon Valley P. O. Pennsylvania. U. S. P. 1,773,598; Aug. 19, 1930.

Example

Xylenol, commercial grade 32 parts. Formaldehyde, commercial grade 37 to 40 per cent strength 21.2 parts.

These materials are placed into a suitable digester equipped with an efficient stirrer and provided with a suitable condenser for distillation. With the condenser set in a distillation angle the product is boiled vigorously. Stirring being maintained during the entire reaction and distillation cycle. There is evidently an immediate combination between the xylenols and formaldehyde as there is only a trace of formaldehyde present in the distillate, moreover, the distillate has practically no formaldehyde odor. It should be noted particularly that no step is called for in this process whereby a refluxing reaction is maintained during any portion of this cycle.

The boiling and distillation is continued for about two hours or for such a length of time and under such conditions of temperature control, etc. until the desired viscosity or combination has been obtained. The reaction goes along smoothly and the removal of both the water of solution and condensation may be removed with little difficulty at ordinary atmospheric pressure as the reaction product is thin at the early stages of the reaction and as the solubility of water in xylene is low.

From 15 to 18 parts of distillate will be removed depending on the completeness of the reaction and on the strength of the formaldehyde solution used. The temperature of the contents of the digester start boiling at about 212° F. and the temperature increases as the water is eliminated until a temperature the product will be a hard grindable resin. For varnishes and gums and temperature of from 250° to 270° F. will produce a desirable product. With vacuum distillation at the end of the reaction or say after a temperature of 250° F. has been reached a hard resin can be obtained on large batches with less precautions.

Hexamethylenetetramine. Gustave E. Landt and William H. Adams, Jr., assignors to Continental Diamond fibre Company. U. S. P. 1,774,929; Sept. 2, 1930.

A continuous process for the manufacture of hexamethylenetetramine which comprises reacting ammonia and formaldehyde in alcoholic solution at a temperature below 75° C.

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and removing the crystals of hexamethylenetetramine as they separate from the solution.

A process for preparing a synthetic resin varnish vehicle which comprises passing formaldehyde and ammonia into alcohol at a temperature below 75° C. to form hexamethylenetetramine, there being present sufficient alcohol to keep the hexamethylenetetramine in solution.

Colorless and Transparent Phenol and Urea Resin. Michisuke Nakamura, assignor to Sankyo Kabushiki Kaisha, of Japan. U. S. P. 1,775,135; Sept. 9, 1930.

The acid condensation product of a phenol and formaldehyde becomes brittle if heating is long continued; but on the other hand it turns into a solid substance as colorless and transparent as glass as said before. According to my invention these two phenomena are well utilized and combined. The following is an example of carrying the invention into practice:—

First, prepare the oily condensation product of phenol and formaldehyde, (suitably supplied as formalin using hydrochloric acid or the like as a catalyst, to which add 25 to 80 per cent of the gelatinous condensation product produced by heating and condensing a mixture of 1 part of urea with 4.5 to 10 parts of 40% formalin with or without hydrochloric acid or the like as a catalyst. Then, completely evaporate the water contained therein under vacuum or ordinary atmospheric pressure or by other proper means. If it desired to obtain the product in solid form, conduct the compound into the desired mold while it still retains the proper fluidity, and harden it by continually heating it in a closed or open vessel for one to five days at the temperature of 80° C. which is to be gradually raised to about 130° C.

Polymerizing Vinyl Compounds. Charles O. Young and Stuart D. Douglas, assignors to Carbide & Carbon Chemicals Corporation. U. S. P. 1,775,882; Sept. 16, 1930.

Example I

1750 parts of vinyl chloride, 1750 parts of vinyl acetate and 70 parts of lead ethyl are added to 1500 parts of acetone in a pressure autoclave, preferably made of steel and lined with tin or lead and heated at 100° C. for 24 hours. A tacky, white viscous resin solution is formed.

Example II

70 parts of vinyl chloride and 1.4 parts of lead ethyl are added to 30 parts of acetone and heated for 20 hours in a suitable autoclave at 80° C. A white, viscous gelatinous resin solution is formed.

Example III

105 parts of vinyl acetate and 2 parts of lead ethyl are added to 45 parts of acetone and heated for 24 hours in a suitable autoclave. A viscous, glassy resin solution is produced.

Lead tetraethyl can be used in

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Fig. 1 represents a valve for operating Semi-Automatic Presses for Hot or Cold Molding, using high and low water pressures and Relief, either with or without single or double "Pull-Back" cylinders. The operating lever can be placed in any position shown in Fig. 2.

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Fig. 1

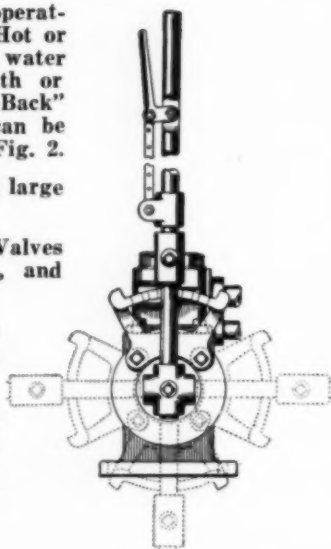


Fig. 2

Established 1872.

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conjunction with other catalysts, and actinic light or other accelerating influence can of course be applied.

Manufacture of Phenolic Resins. Norman Strafford and Eric Everard Walker, assignors to British Dyestuffs Corporation Ltd. U. S. P. 1,776,202; Sept. 16, 1930.

Example 1

Equal parts by weight of wood meal and a solid phenol formaldehyde resole containing about 10 per cent free phenol and a somewhat larger proportion of other soluble phenolic materials of low molecular weight are milled together on warm incorporating rolls. When cold the intimate mixture of resin and wood meal thus obtained is finely ground and suspended in water. The pH is adjusted to 6 by the addition of dilute acid or alkali while stirring. The water is decanted off and the powder is washed three times with approximately eight times its weight of water. The pH may then be adjusted to any desired value. The powder which is now granular, free from tackiness and easily filtrable is separated from the water, dried in vacuo and is then ready for use. The phenol content of the purified powder is about 0.2 per cent. (The exact figure depends on the efficiency with which the washing process is carried out). The wet powder may be then incorporated with plasticizers, colouring matters and hardening catalysts, or such of them as are not soluble in water may be added before the washing is carried out.

A similar result is obtained by using in place of wood meal about an equal weight of wood pulp, cotton and other textile wastes, asbestos or other fibrous or cellular material.

Manufacture of Phenolic Resins. Norman Strafford and Eric Everard Walker, assignors to British Dyestuffs Corporation Ltd. U. S. P. 1,776,203; Sept. 16, 1930.

Example

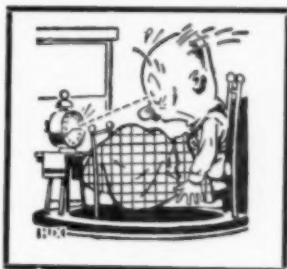
Sheets of paper are impregnated with an alcoholic solution of resole and then allowed to dry. The sheets are then washed in several changes of water at 40°-50° C. The phenol content of the resole is reduced to 3 per cent or less, the exact degree of purification depending on the degree of washing, the thickness of the impregnated sheets, and the resin content. The colouring matter, plasticizers, hardening catalysts, etc. may be added to the resin before impregnation provided these are such as not to be dissolved out during washing.

Stencil Sheet. Ernest E. Novotny, of Philadelphia, Pennsylvania. U. S. P. 1,776,368; Sept. 23, 1930.

1. An impressible stencil sheet having a porous base and a coating including a cellulose ester and ethyl oleate.

2. An impressible stencil sheet having a porous base and a coating including a cellulose ester, an alkyl ester of oleic acid and a wax.

You Must Be Awake



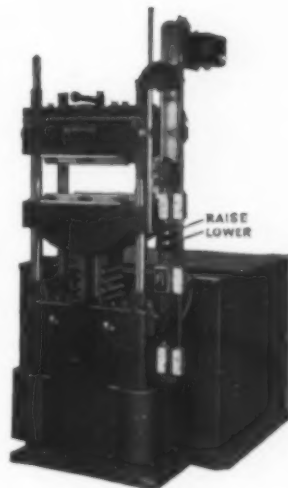
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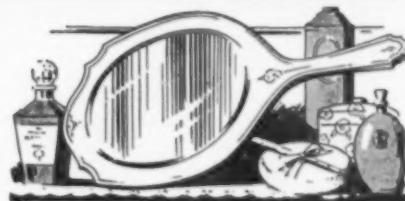
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And Now, In Closing:

WELCOME, 1931! . . . You were long enough coming! . . . And, while we're at it, welcome to the "Durez Molder," General Plastics' new house organ . . . interesting enough to deserve a more plural title . . . and worth quoting, too, especially the inside front cover . . . We are not going to talk business or unemployment this month . . . (Prolonged applause) . . . You will get a lot of it in February . . . It may or may not be secret, but we understand that an Eastern Company has helped a Western one lick the problem of molded Cat-sup-bottle caps . . . No; neither of them are molders! . . . The Molded Insulation Company, late of Mt. Vernon has moved to 3246 Ludlow Street, West Philadelphia . . . Mr. Zelov in charge . . . they are allied with Bendix Aviation . . . Some of their old employees are still functioning in the original place under the name of Mico Co., Inc. . . . Alliterative, huh? . . . Eastern Pearl Button are going in for it too, in case you don't know . . . Herman Pohle, V. P. of the Burnet Co., has had quite a trip through New England. Just returned . . . The President of Tre-Jur (Perfume) has demoted himself to Sales Manager for 1931, saying that anybody can be President; what's needed is sales . . . There's a man who creates unemployment—(Pardon!) . . . Did he demote his salary too? . . . We understand (reliable authority, etc.) that McKinley is out of Bryant . . . he is now in the South, hunting . . . L. G. Sylvester helped unemployment — whoa! . . . anyhow, he went to the Army-Navy game . . . Speaking of the pig-skin, the genial Aumend of the National Elec (oh, you know!) used to play at Marietta College . . . Made the Second All-American team in 1917

. . . Elsewhere in this issue should be news of the American Record² Consolidated Film deal . . . We forgot to say that Cunningham has moved into McKinley's office; that "watered resin" often "backs up a ducks roll;" that if you're in business for your health, "Buy Apples;" we thank one and all for their fine Christmas cards . . . and the same goes for you.

WE have steadfastly refused to give business Christmas cards. This hasn't been petulance; nor, indeed, lack of affluence. It has simply been habit. We successfully dodge the issue again this year by giving all our subscribers a well chosen present. If you will look for our page announcement in this issue you'll see what we mean. If perchance you are not a subscriber and are reading this over your friend's shoulder, you had better look anyway.

OUR friends in Washington are certainly thinking up work for themselves. Read the following portion of the tariff act which has been called into enforcement recently in New York:

"It shall be unlawful to import into the United States any merchandise of foreign manufacture if such merchandise or the label, sign, print, package, wrapper or receptacle bears a trademark owned by a citizen of or corporation created or organized within the United States and registered in the Patent Office."

WE have been spoken to. Yes, and by several people. They have said, in brief, that many of our comments on this page during the past year have been far too caustic, sometimes sarcastic and often tinged

with black instead of rose. They haven't, of course, denied the truth of those statements to which they object. Truth has an unpleasant habit of hurting, once in a while, but it is like a strong astringent—the pain is necessary to effect a cure. There have been many reasons for our often finely-tempered words. In this adolescent industry there is a preponderance of right thinking and steady growing. We dwell on some of its evils not because they are unusual, for many young industrial efforts have had far worse ones, but because they have destroyed growth, hampered development and retarded ability to a degree out of proportion to those who deal in principles. Men are awake, but they are often heavy-lidded from the effects of the immediate job. A dash of cold water can work a world of good, if it isn't too cold.

WONDERING what you can be thankful for as another year drops by? We don't believe it. This is an industry bound to eternal needs, strong in its foundations, bright in its reflections. There are worries; sometimes many more than ever will be solved, but as each succeeding year passes the older trials will seem trivial and, if remembered at all, only with the thanks that they were not greater. As a publisher, writer or editor nothing can be predicted, philosophized or phantasied without contradiction: as one man talking among friends we can say "give thanks" and truthfully, with a full heart, join in the giving. That we are blessed, sometimes, with the impossibility of giving is adequate cause; that we have friends, families, work, comfort, health—all are reason enough and almost any one is sufficient.